



UVA Tapestry Workshop 2016

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

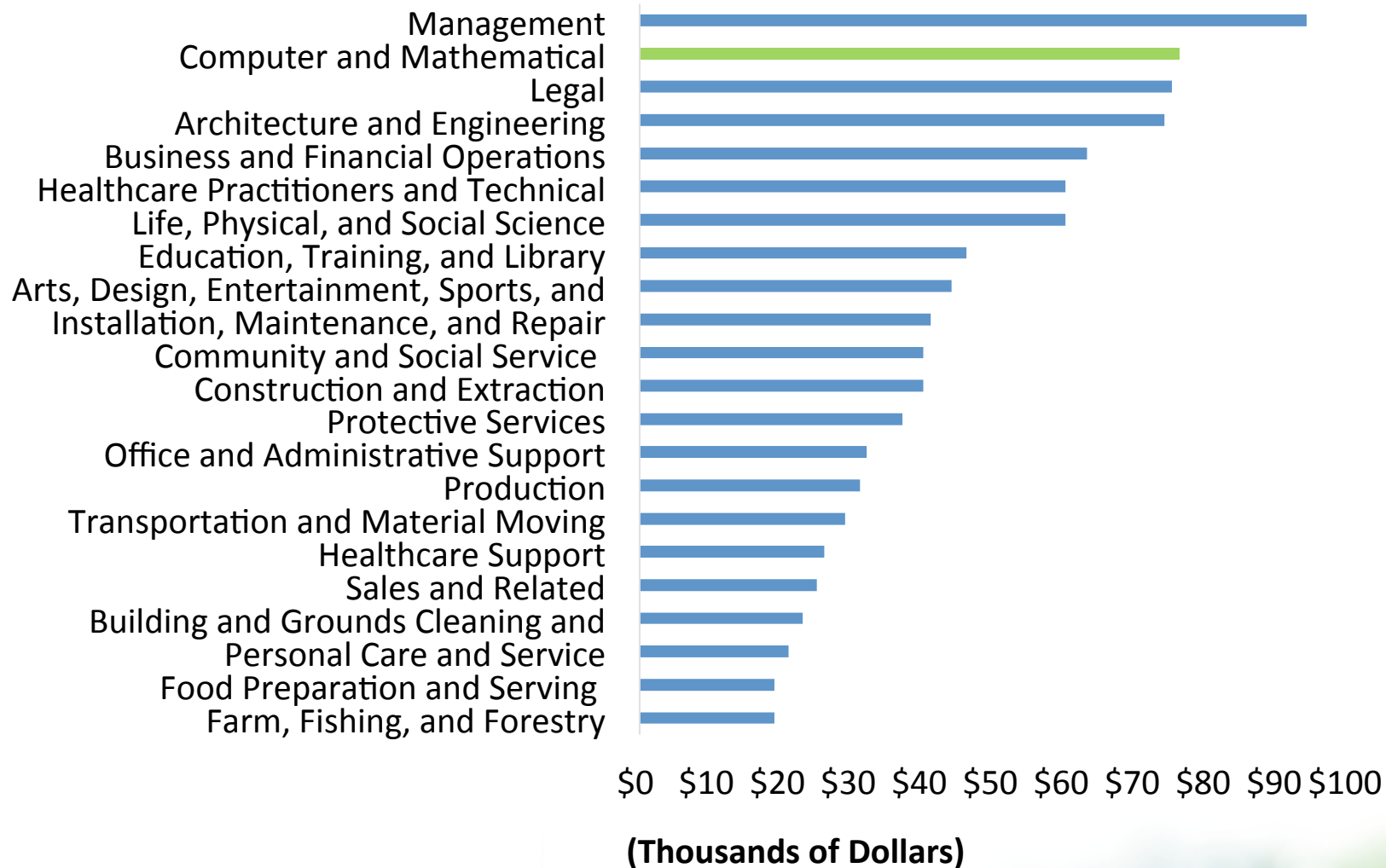
CS is an intellectual activity that asks questions like...

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



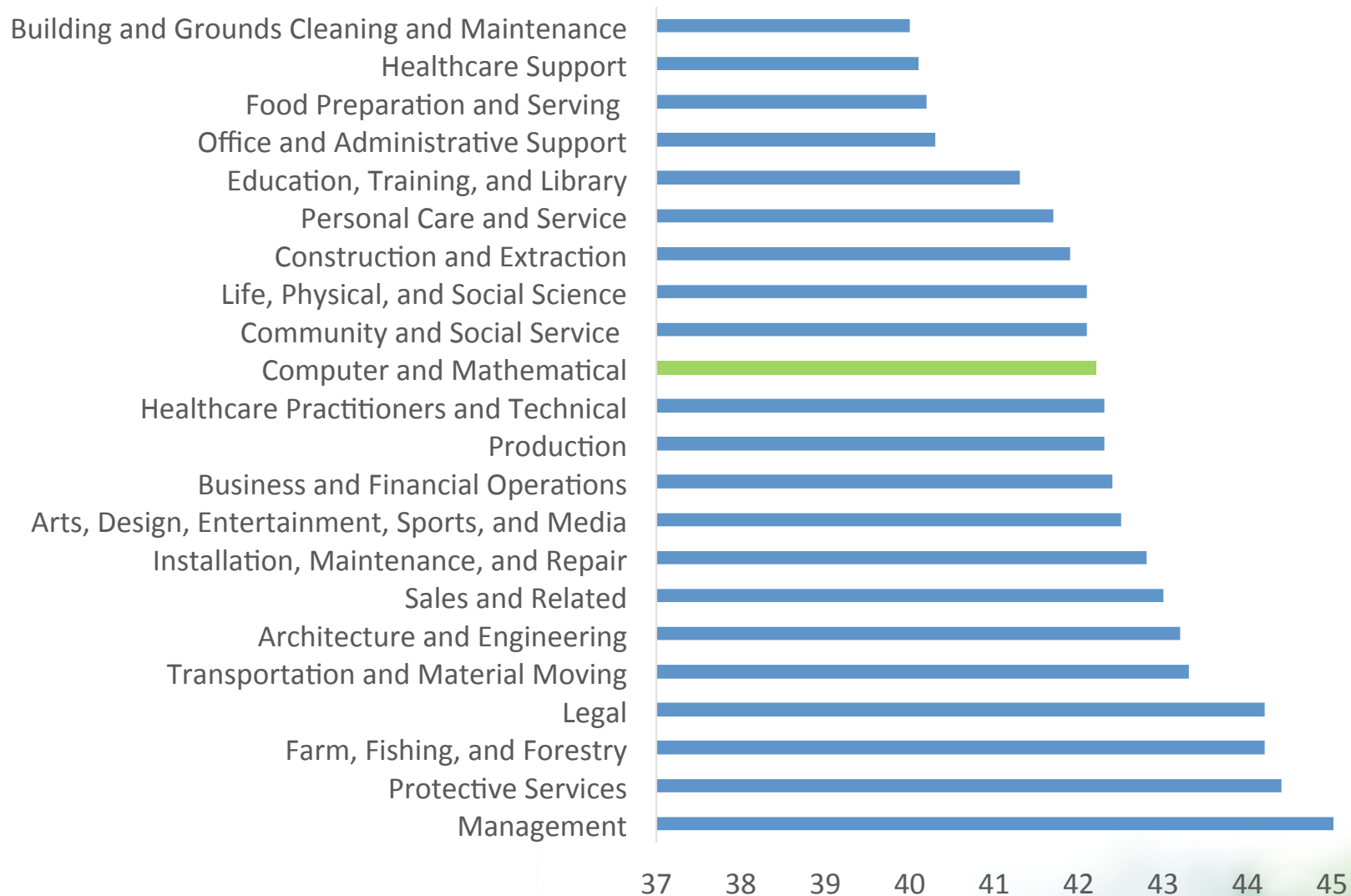
Computing occupations pay well

Median Annual Wage for Major Occupational Groups



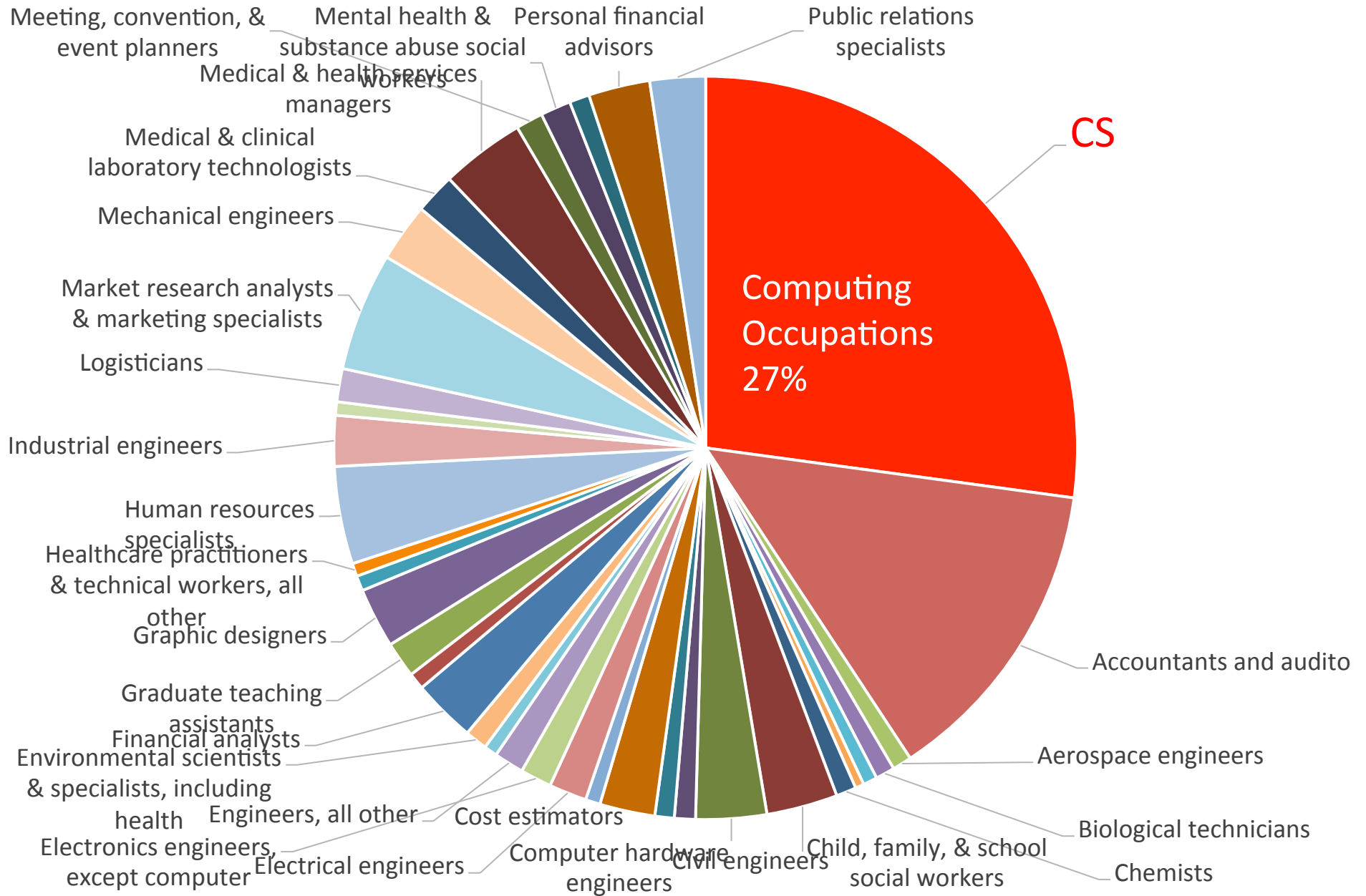
Computing occupations let you have a life

Average Hours Per Week for Major Occupational Groups

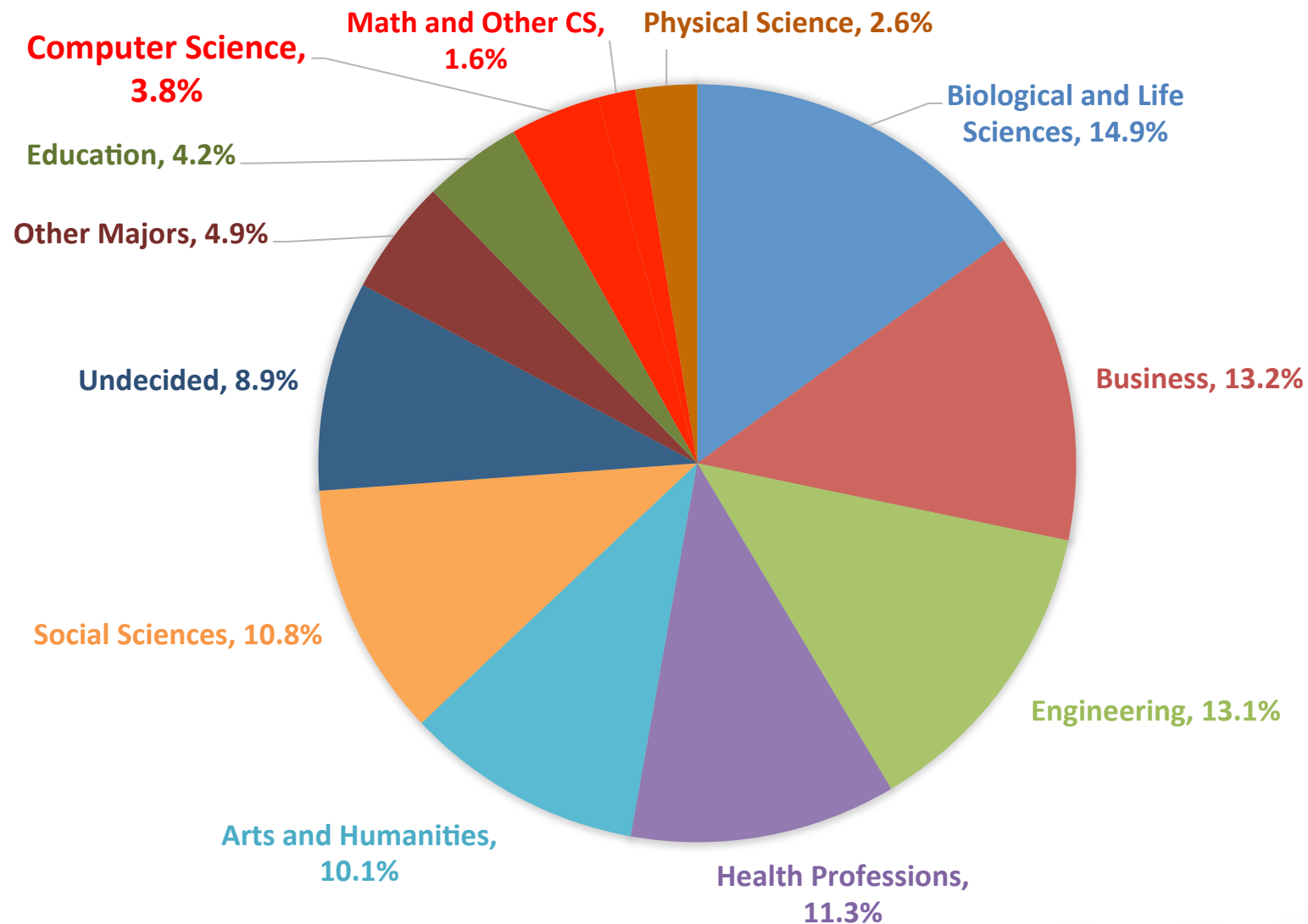


**BUT COMPUTING HAS A PROBLEM.
IT ATTRACTS TOO FEW PEOPLE.**

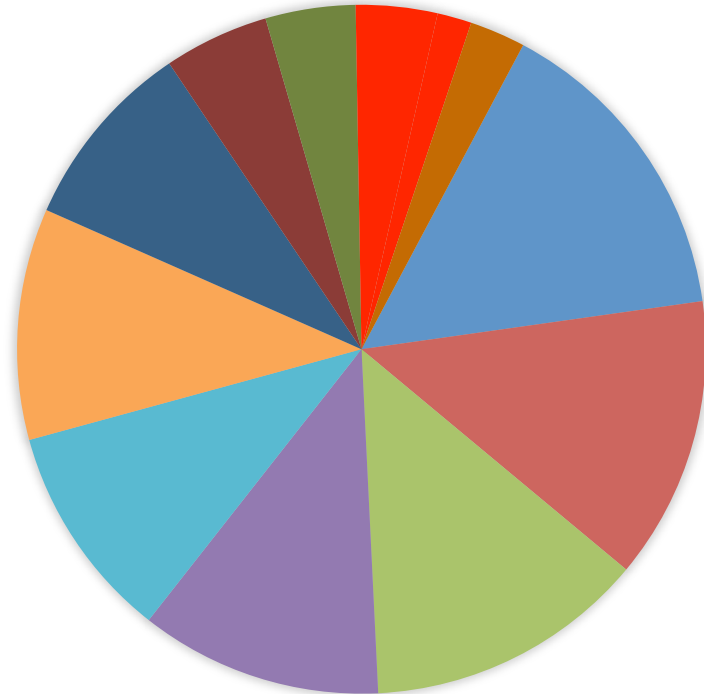
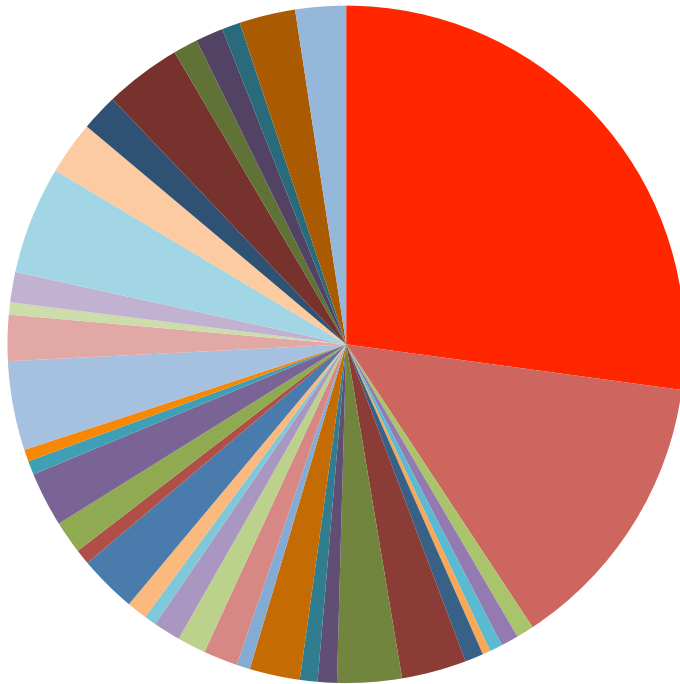
BLS Projected 2022 employment: Jobs requiring degree



2015 Intended Major (national sample)



Let's compare...

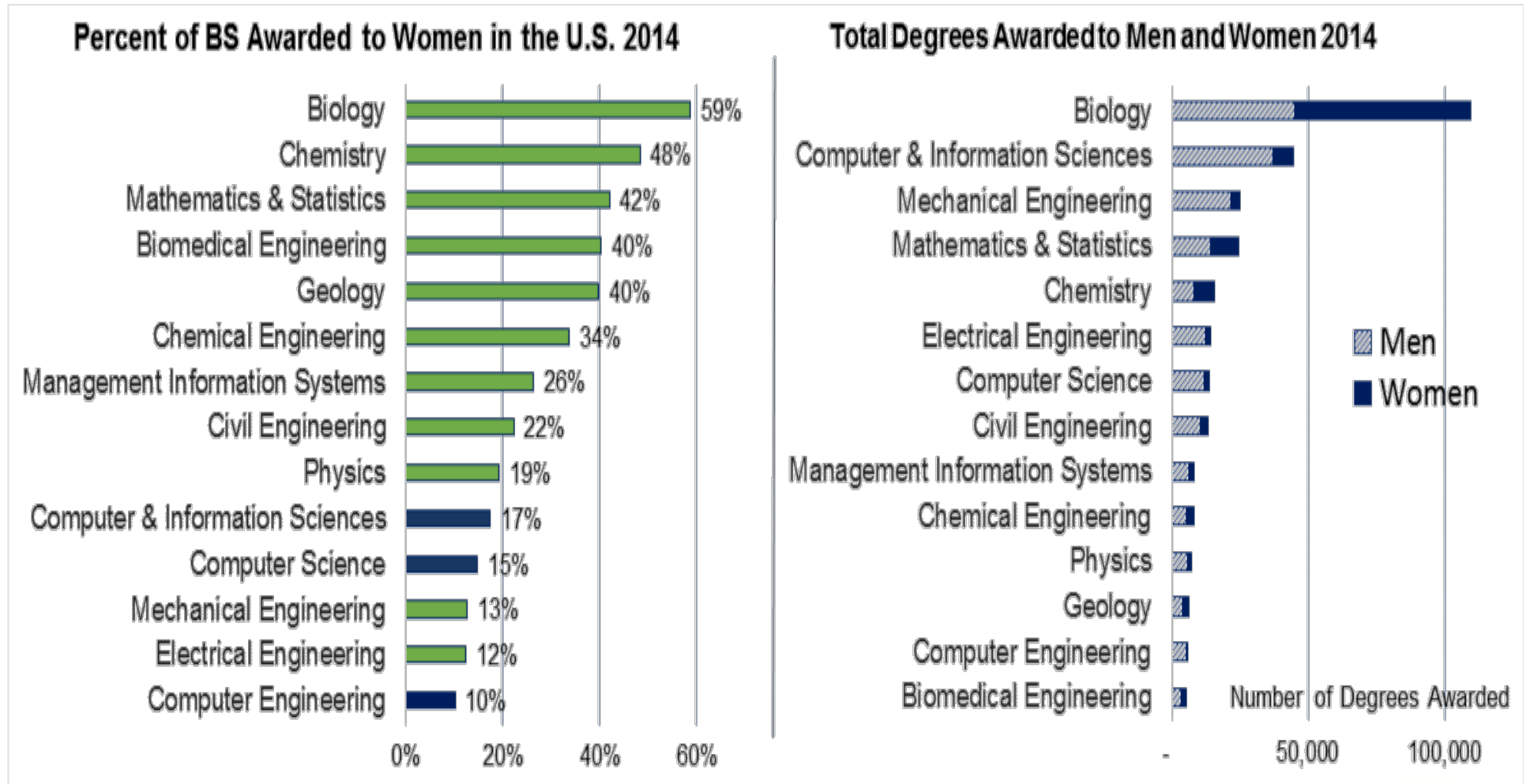


Demand and low production explains the CS initiatives

- 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

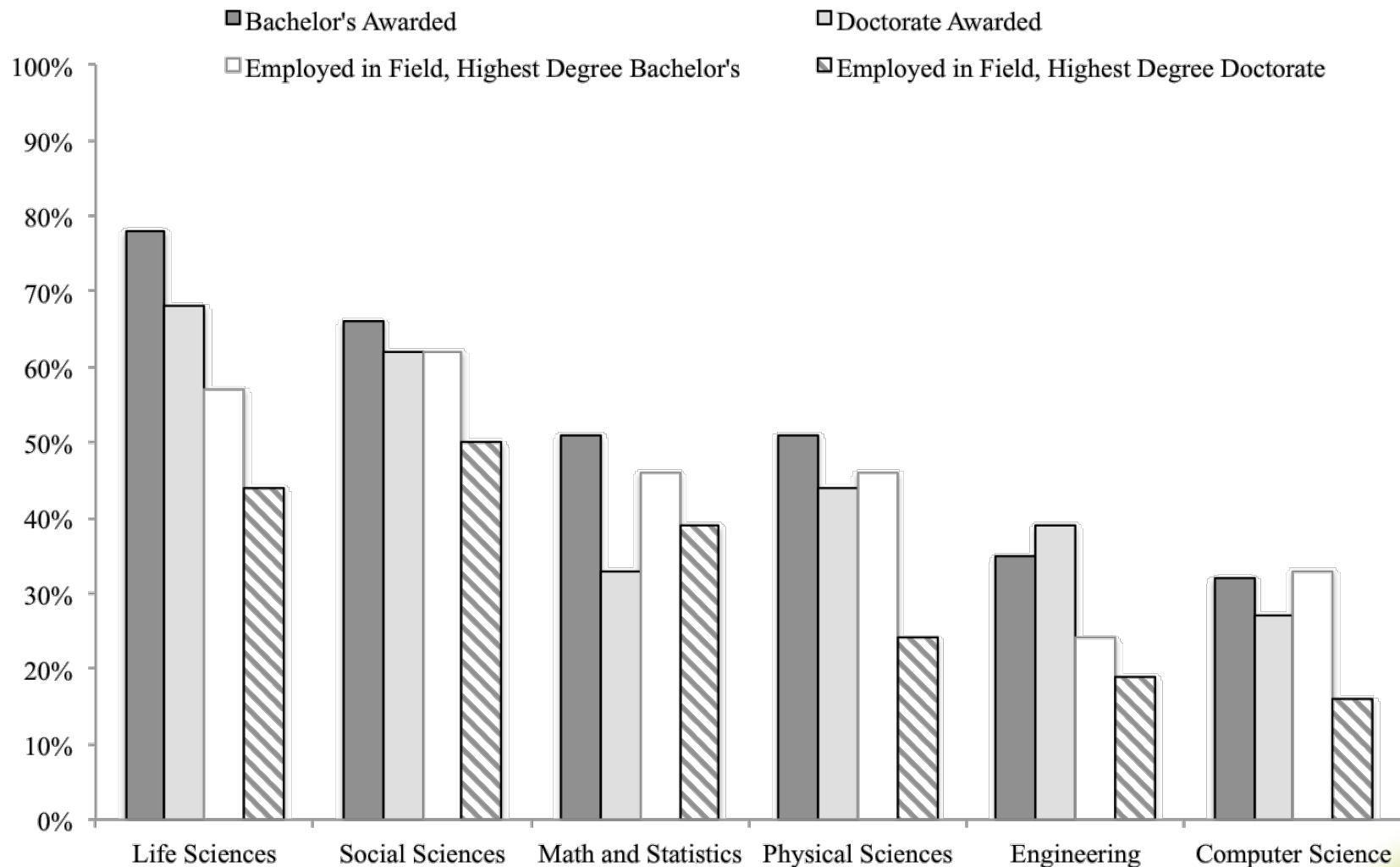
**BUT COMPUTING HAS A PROBLEM.
IT ATTRACTS A NARROW RANGE OF PEOPLE.**

Women's Presence in STEM Disciplines Varies



Source: Data Retrieved from National Center for Education Statistics Integrated Postsecondary Educational Data System, 2015.

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

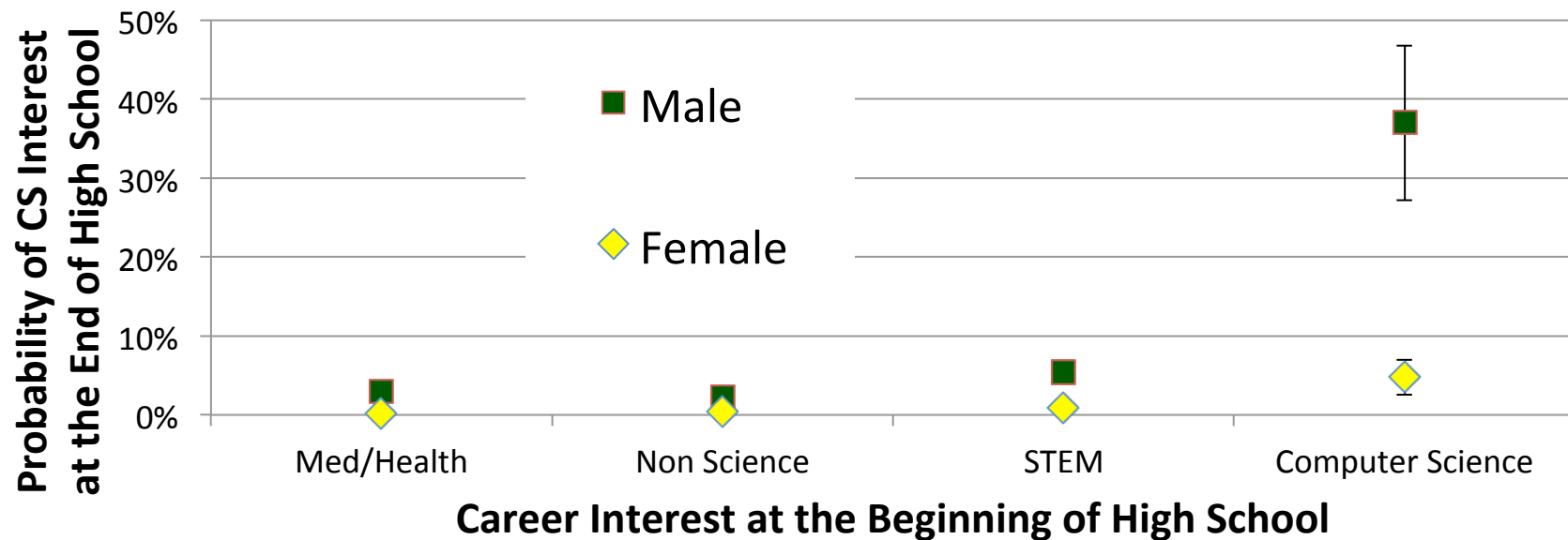
ncwit.org/businesscase



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

Maltese, A.V. and Tai, R.H. 2011. Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among U.S. students. *Science Education*. 95, 5, 877–907.

Trusty, J. 2002. Effects of high school course-taking and other variables on choice of science and mathematics college majors. *Journal of Counseling & Development*. 80, 4, 464–474.

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

Riegle-Crumb, C., & King, B. (2010). Questioning a White Male Advantage in STEM: Examining Disparities in College Major by Gender and Race/Ethnicity. *Educational Researcher*, 39(9), 656–664.

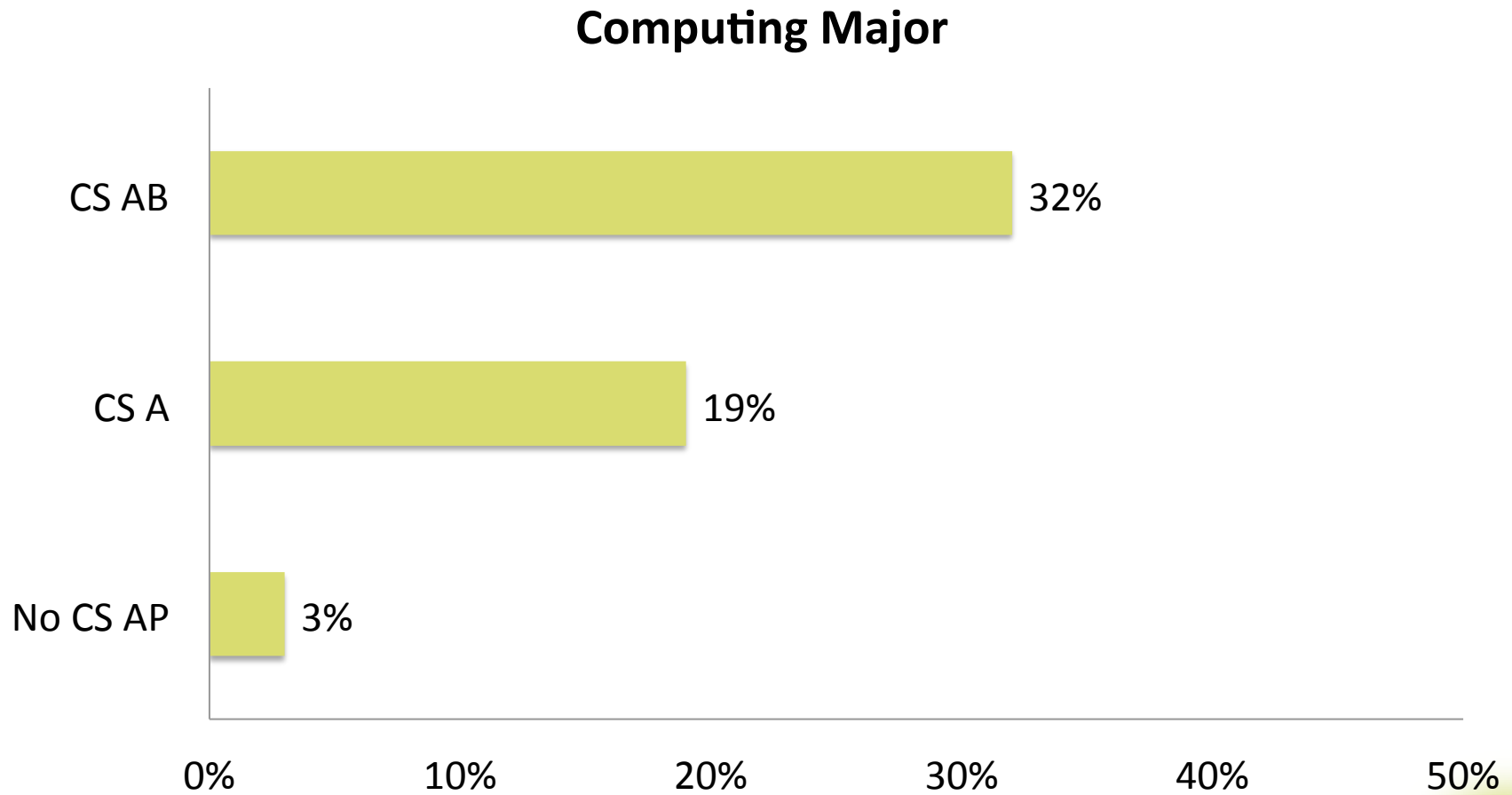
Trusty, J. (2002). Effects of High School Course-Taking and Other Variables on Choice of Science and Mathematics College Majors. *Journal of Counseling & Development*, 80(4), 464–474.

Experience increases success

Experienced students get better grades in Intro CS.
Experience typically assumed.



AP-takers are more likely to major



Girls are well qualified.

Girls take many engineering/CS pathway AP tests:

- 60% of all AP Biology
- 49% of all AP Calculus AB
- 42% of all AP Calculus BC
- 48% of all AP Chemistry
- 55% of all AP Environmental Science
- 40% of all AP Physics 1
- 52% of all AP Statistics

But fewer specific tests:

- 22% of all AP Computer Science A
- 32% of all AP Physics 2
- 24% of all AP Physics Electricity/Magnetism
- 27% of all AP Physics Mechanics

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.