

Broadening Participation in Computing: It Starts before College

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National Science Foundation

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The computing community in the U.S. faces three significant and interrelated challenges in workforce development.

- Underproduction of degrees
- Underrepresentation
- Lack of a presence in K-12



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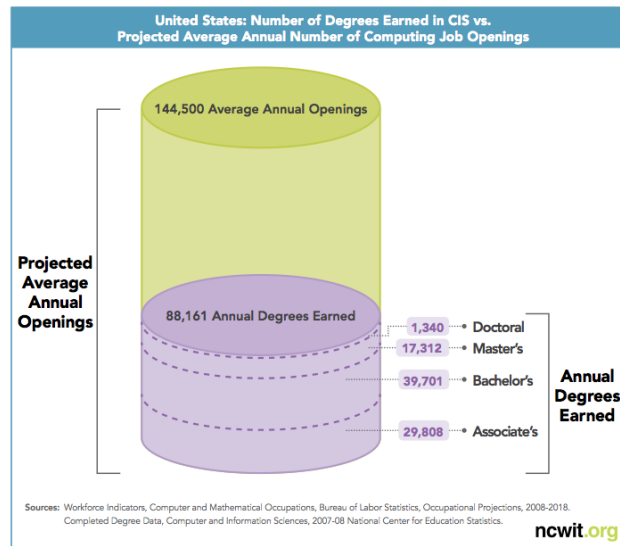
- Underproduction of degrees ←
- Underrepresentation
- Lack of a presence in K-12

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Projected Annual Underproduction

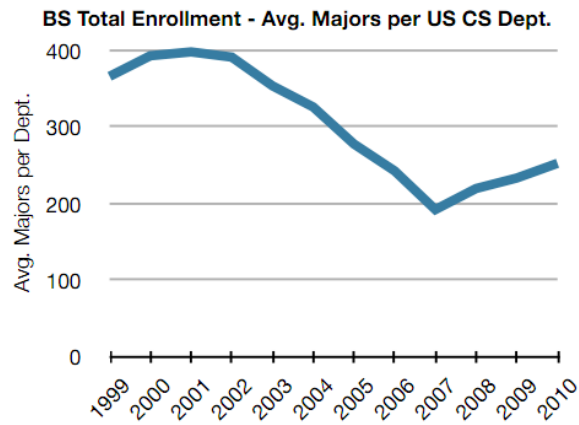


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CS & CE Majors



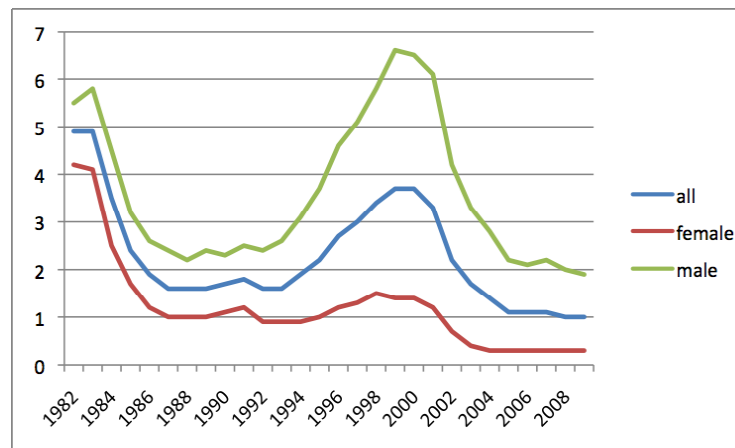
—CRA Taulbee Survey, 2011

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% Intended CS majors



— Data source: HERI, Slide: NCWIT

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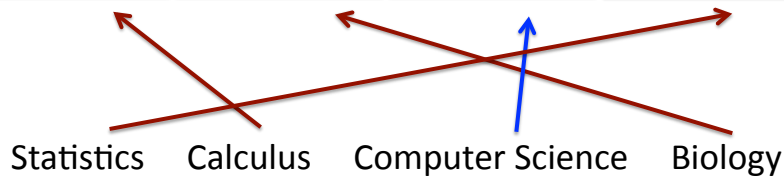
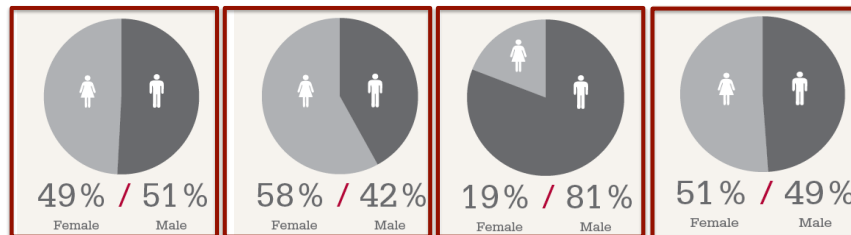
- Underproduction of degrees
- Underrepresentation ←
- Lack of a presence in K-12



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2010 AP Gender Gap



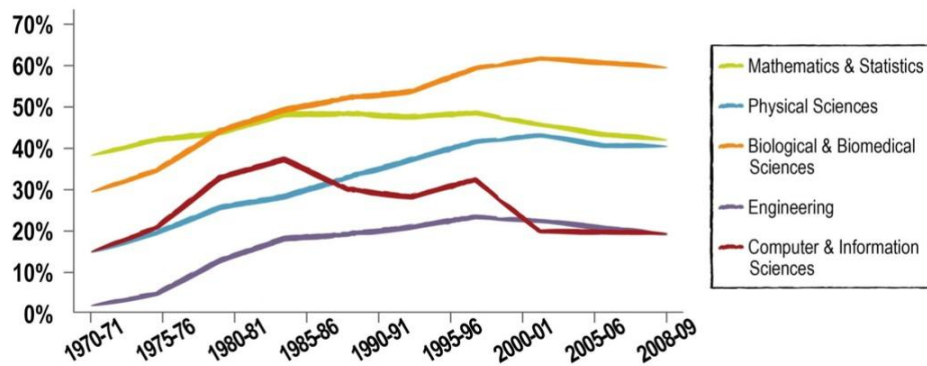
—College Board, 2010



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Female % of STEM Undergrads



©NCWIT. Source: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System.

ncwit.org/scorecard

In 2010, underrepresented minorities

- Received just 10.6% of the bachelor degrees, 4.8% of the masters, and 3.6% of the PhDs.
- Only 49 of 1,620 Ph.D.s were awarded to African Americans or Hispanics.



- Underproduction of degrees
- Underrepresentation
- Lack of a presence in K-12 ←
 - No research base
 - Not taught in most schools

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The percentage of U.S. high school students taking STEM courses has increased over the last 20 years for all STEM disciplines *except computer science, where participation dropped from 25% to 19%.*

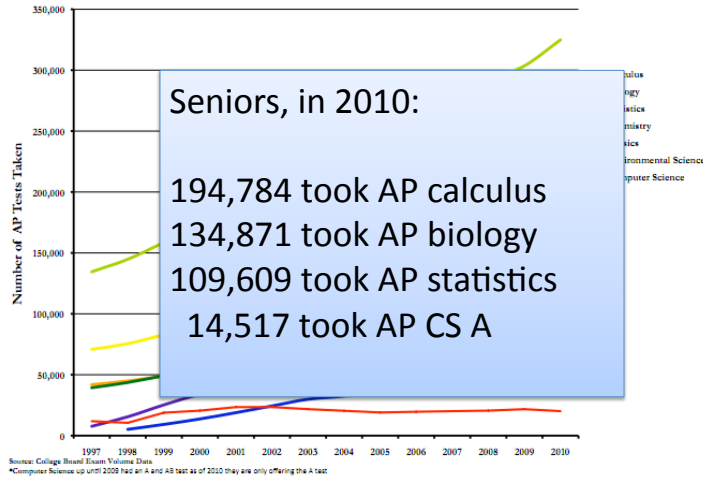
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—2009 NAEP High School Transcript Study



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High School Participation in AP STEM Disciplines



—Data: College Board, 2010 Slide: CSTA

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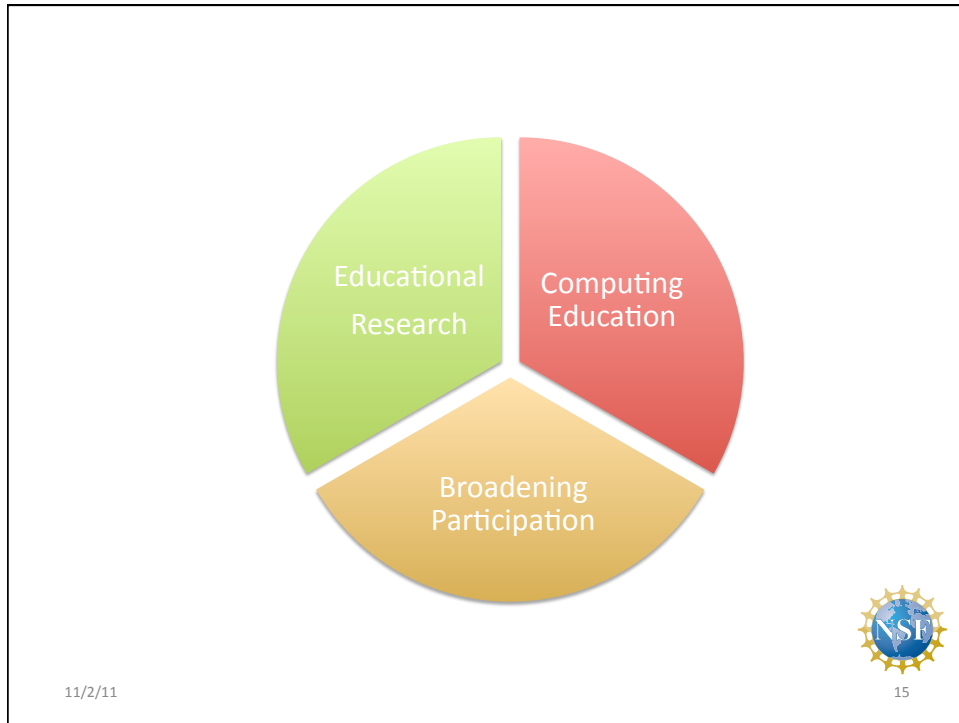
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Education issues in K-12 disproportionately affect students from the underrepresented groups.

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Computing Education for the 21st Century

GOAL: Increase number and diversity of K-14 students and teachers who develop and practice computational competencies, so that students have the necessary interest and skills to pursue degrees in computing and computationally-intensive fields

High School is key.

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Why High School?

- We need to do *much* better there
- Without the HS piece, anything we do for middle school will be lost.
- Without the HS piece, anything we do at the college level will be insufficient.

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CS 10K Project

Develop effective new high school computing curricula and get that curricula into courses taught in 10,000 schools by 10,000 well-prepared teachers by 2015.

CS Principles (AP) &
Exploring Computer
Science



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Why AP?

- Often the only CS course that carries college prep credit
- Attractive to students & schools
- 2,000 CB-audited teachers
- Single point of national leverage
- Fidelity of replication



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CS Principles



- Engaging, accessible, inspiring, rigorous
- Focused on the fundamental concepts of computing (Computational Thinking)

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Timeline

2009-2010

- ✓ Course framework

2010-11

- ✓ Pilot I: Five colleges
- ✓ College Survey
- ✓ College attestation/support

2011-12

- Pilot II: Official & Unofficial

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Exploring Computer Science

- LAUSD, Jane Margolis
- Piloted ECS 08/09
- ~25 LAUSD schools 11/12
- 2000 students, 40% female, 81% URMs
- Spreading in CA, CCEAN
- Complete, detailed curriculum
 & lessons plans on CSTA site
- Collaboration with CENS
- "G" credit and CTE credit
- Also taught in San Jose & Oakland, Chicago



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ECS & CS Principles Pilot Sites 2011-12



CS 10K Project

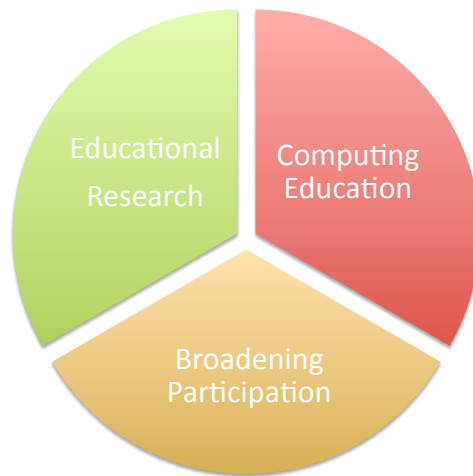
- Additional course curricula, materials, models
- Standards & assessments
- Teacher preparation **X 10,000**
- Entrée into schools

NSF

Yikes!



Beyond NSF's mission and resources



BPC Alliances (BPC-A)

- 13 Alliances
- Large regional or national collaborations that aim to decrease underrepresentation



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Focus: students with disabilities

- individual students
- faculty members who need help in accommodating students
- departments in making more accessible and welcoming environments
- the computing community in building awareness



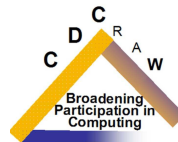
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Focus: statewide (Massachusetts) transitions in K-20 pipeline.



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CRA-W/CDC

Focus: research experiences and mentoring at university, graduate and research levels nationally.



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Focus: providing resources and advocacy nationally

- clearing house
- resource center
- a spokes group
- convener



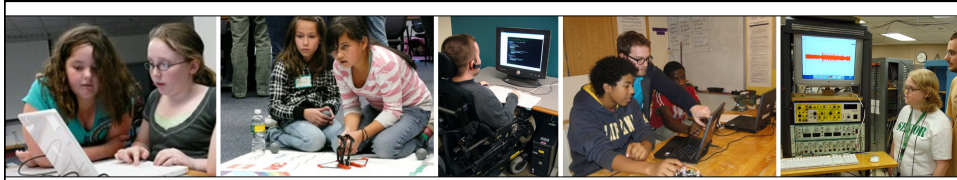
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The collage features several digital assets:

- Computing in the Core:** A website header with navigation tabs for 'ABOUT', 'ISSUES & SOLUTIONS', 'FACTS & RESOURCES', 'NEWSROOM', and 'EVENTS'. A map of the United States highlights states where computing jobs are projected to be filled by computer degrees.
- dot diva:** A blog post titled 'dot diva' with a photo of a woman holding a globe. The text discusses the impact of computing degrees on job openings.
- CSEdWeek:** A 'PLEDGE FOR CSEdWeek' graphic for the week of 11/7 & 11/8, with a 'SIGN UP TO PLEDGE' button.
- Running On Empty:** An article snippet titled 'Running On Empty: The Future is Now for K-12 Computer Literacy in the Digital Age'.
- NSF Logo:** The National Science Foundation logo is present in the bottom right corner of the collage.
- Person:** A stylized illustration of a woman in a lab coat holding a laptop.

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Thanks!

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