PATH NOT FOUND: DISPARITIES IN ACCESS TO COMPUTER SCIENCE COURSES IN CALIFORNIA HIGH SCHOOLS

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The Need for Computer Science

- Computing occupations are among the highest-paying & fastest-growing occupations.
- Will be **1.3 million** job openings in computing and mathematical occupations by 2022.
- Yet, across California, **65%** of public high schools offer NO computer science courses and only **13%** offer the AP Computer Science course.
- Just 6,676 of the state's 1.95 million high school-aged students (**.03%**) took the AP Computer Science exam in 2014.

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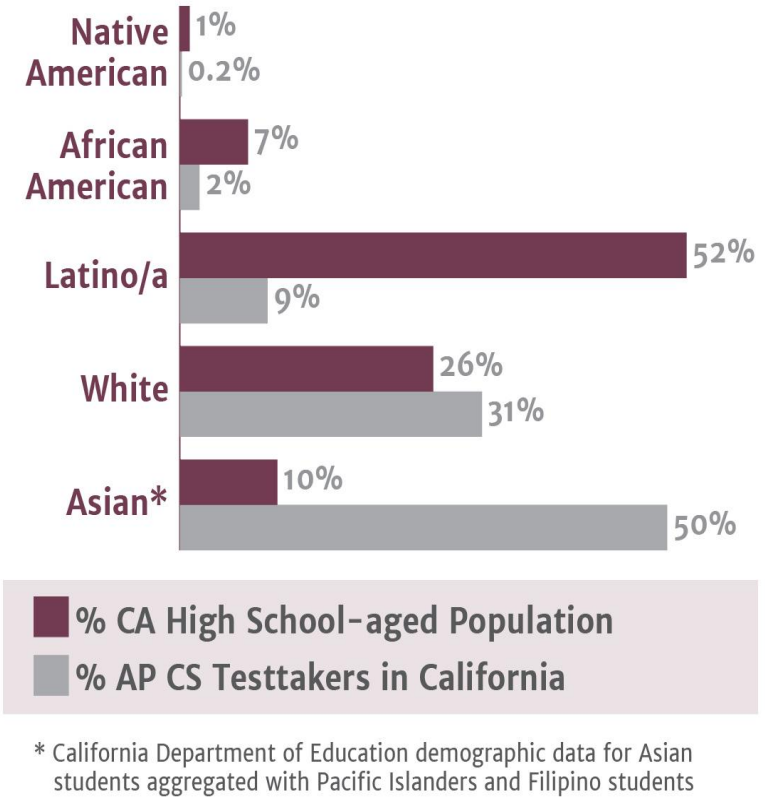
Underrepresentation in CS

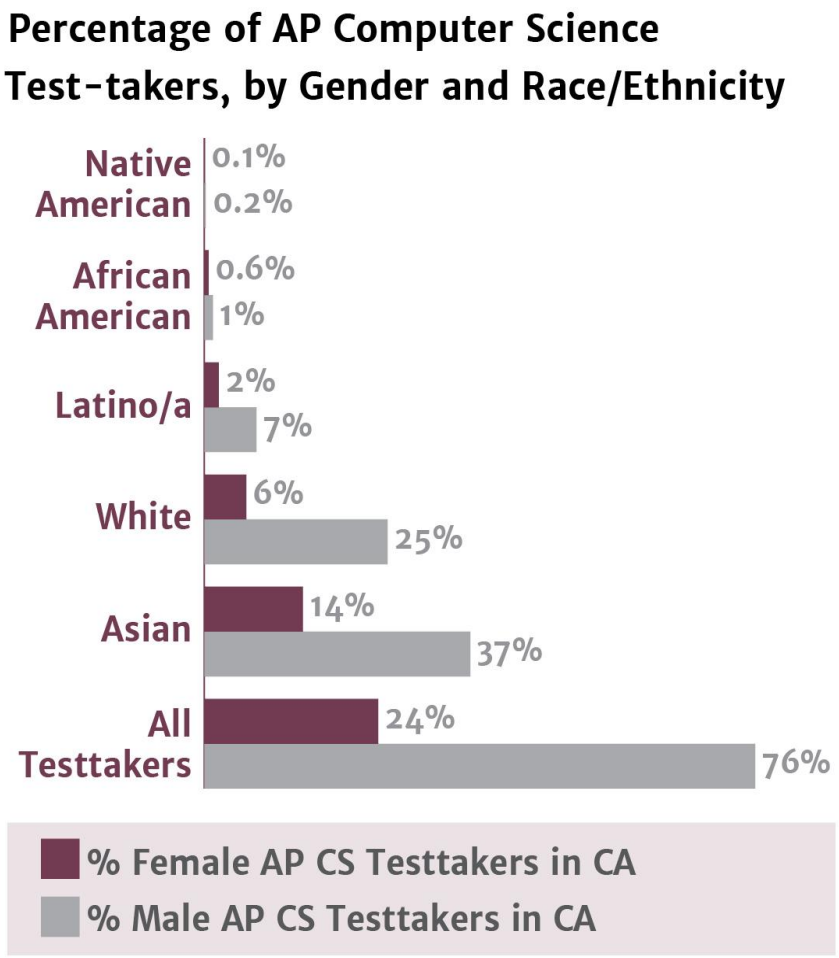
African-American and Latino students make up **59%** of California public school students but were just **11%** of 2014 AP Computer Science test takers.

Percentage of AP Computer Science Test-takers and Statewide HS Population, by Race/Ethnicity



* California Department of Education demographic data for Asian students aggregated with Pacific Islanders and Filipino students

Underrepresentation in CS



Underrepresentation in CS

- African Americans and Latinos **combined** account for only:
  - **17%** of all computer science Bachelor's degrees
  - **7%** of all computer science Ph.D.'s
  - **6%** of computer science faculty
  - **9%** of the computing workforce nationwide
- Causes of underrepresentation in CS include:
  - Lack of engaging and culturally relevant computing curriculum
  - Lack of diverse role models and peer networks
  - Negative racial and gender stereotypes about ability
  - Implicit bias & unwelcoming classroom, lab, & workplace environments
  - **Lack of access to rigorous computer science courses**

Key report findings

- In California public high schools:
  - Nearly **75%** of schools with the highest percentage of underrepresented **students of color** offer **no** computer science courses.
  - Just **2%** of schools with the highest percentage of underrepresented **students of color** offer AP Computer Science.
  - Over **75%** of schools with the highest percentage of **low-income students** offer **no** computer science courses.
  - Only **4%** of schools with the highest percentage of **low-income stu**dents offer AP Computer Science.
  - In San Francisco Unified and Oakland Unified School Districts **combined** (Silicon Valley's backyard), under **2%** of students are enrolled in computer science.
  - Of the more than half a million high school students in California's **largest 20 districts**, just **1%** are enrolled in any computer science course.
  - **5** out of the largest **20** districts in California do not offer any computer science courses.
  - **10** out of the largest **20** districts in California do not offer AP Computer Science.

Definitions

- "Computer science course" refers to courses with either "computer science" or "computer programming" in the title.
  - Doesn't include the often conflated computer-based courses on information technology & computer literacy/usage.
  - Informed by the CSTA's definition of Computer Science Education.
- We define "underrepresented students of color" as African American, Latino, and Native American (populations that are disproportionately underrepresented in computing).
  - While disparities also exist within Asian and Pacific Islander populations, there isn't sufficient data to disaggregate by subgroups within these categories.
- We define low income students by Free/Reduced Price Lunch eligibility.
- "English learner" students are defined by the California Department of Education as having a primary language other than English.
- *Methods:* Level Playing Field Institute analyzed data from the California Department of Education & the College Board (computer science course offerings, school and district demographic data, & student enrollment data).
  - With the exception of alternative/continuation schools, and schools with fewer than 100 students, all California public high schools were included in analyses.
  - Analysis is based on most accurate data available, though there may be reporting errors from schools or districts.

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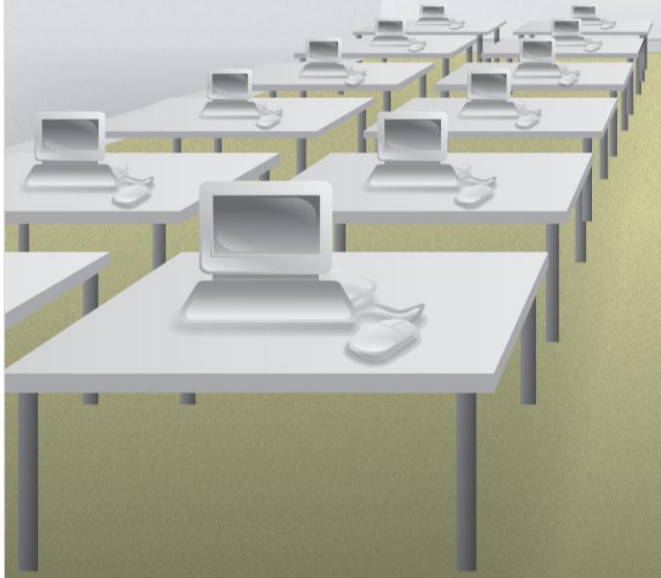
FURTHER FINDINGS

Computer science course ***availability is considerably lower*** in California public high schools that have ***high populations of underrepresented students of color***.

Schools with the highest percentage of underrepresented students of color offer **AP Computer Science** at a rate ***twelve times lower*** than schools with the lowest percentage of underrepresented students of color.



Schools with the highest percentage of underrepresented students of color offer **computer science courses** at a rate nearly ***half*** that of schools with the lowest percentage of underrepresented students of color.

BY THE NUMBERS...

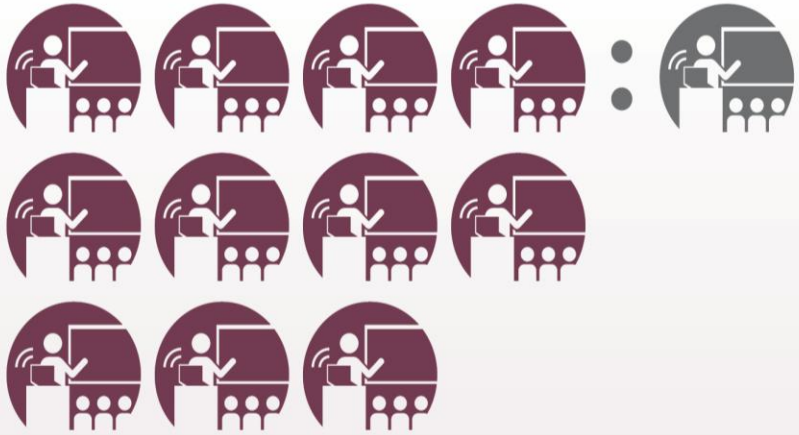
Percentage Underrepresented Students of Color in Total Student Body	Number of CA Public High Schools	Number and Percent of schools offering AP Computer Science		Number and Percent of schools offering *Any* Computer Science	
0–50%	523	126	**24%**	233	**45%**
51–90%	513	44	**9%**	144	**28%**
91–100%	248	5	**2%**	66	**27%**

Computer Science Availability by Percentage of Low-Income Students

LOWEST % OF LOW-INCOME STUDENTS — HIGHEST % OF LOW-INCOME STUDENTS

Schools with the highest percentage of low-income students offer **computer science courses** at a rate **less than half** that of schools with the lowest percentage of low-income students.

LOWEST % OF LOW-INCOME STUDENTS — HIGHEST % OF LOW-INCOME STUDENTS



Schools with the highest percentage of low-income students offer **AP Computer Science** at a rate nearly **eleven times lower** than schools with the lowest percentage of low-income students.

BY THE NUMBERS...

Percentage Low Income Students in Total Student Body	Number of CA Public High Schools	Number and Percent of schools offering AP Computer Science		Number and Percent of schools offering *Any* Computer Science	
1-25%	198	85	**43%**	120	**61%**
26-50%	305	43	**14%**	101	**33%**
51-75%	403	33	**8%**	130	**32%**
76-100%	378	14	**4%**	92	**24%**

Computer Science Availability by English Learner Status

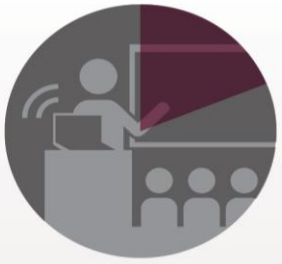
HIGH % ENGLISH LEARNERS IN STUDENT POPULATION

LOW % ENGLISH LEARNERS IN STUDENT POPULATION

Just **31%** of schools with a high percentage of English learners (11% or above) offer **any computer science courses.** In contrast, **39%** of schools with a low percentage of English learners (10% and below) offer any computer science courses.

HIGH % ENGLISH LEARNERS IN STUDENT POPULATION

LOW % ENGLISH LEARNERS IN STUDENT POPULATION



Just **8%** of schools with a high percentage of English learners (11% or above) offer **AP Computer Science**. In contrast, **19%** of schools with a low percentage of English learners (10% and below) offer AP Computer Science.

BY THE NUMBERS...

Percentage English Learners in Total Student Body	Number of CA Public High Schools	Number and Percent of schools offering AP Computer Science		Number and Percent of schools offering *Any* Computer Science	
0–10%	671	260	**39%**	129	**19%**
11% or more	613	187	**31%**	46	**8%**

Recommendations

- Develop **funding strategies** to create equitable access to introductory and Advanced Placement computer science coursework across all California public high schools.
- Ensure all California school districts allow computer science to count as either a mathematics or science high school **graduation requirement**.
- Develop a statewide **shared definition** of what courses constitute "computer science" for use in all California high schools, to create consistency as well as transparency in access.
- Ensure introductory computer science courses provide the necessary **scaffolding** and effective instruction for students of all backgrounds to succeed in advanced computing coursework.
- Ensure computer science curricula, pedagogy, and assessments are **culturally-relevant** and **inquiry-based** in order to engage underrepresented groups and broaden participation in computer science.
- Expand and strengthen the state's **computing teacher workforce** by adopting recently-proposed modifications to California's computing-related supplementary authorization, so fully credentialed teachers in subjects other than mathematics can teach computer science with the proper training and preparation.
- Expand regional **partnerships** between technology companies and California high schools, to capitalize on the prevalence of computer science professionals who can serve as volunteer instructors, mentors, or guest speakers (from underrepresented backgrounds when possible).
- Expand access to in-school & out-of-school **programs designed to develop computing interest** among underrepresented groups, through hands-on projects, field trips, extracurricular activities, and mentorship programs.

Examples of CA initiatives addressing gaps in access

- Los Angeles Unified School District partners with Exploring Computer Science to provide curricula and professional development to educators teaching year-long Exploring Computer Science course at 40 LAUSD high schools.
  - Exposes over 2,300 high schools students (majority are from groups underrepresented in CS) to engaging and culturally relevant CS curriculum.
- San Francisco Unified School District partners with Code.org to broaden computer science access. SFUSD also recently passed initiative to make CS compulsory for all students in grades Pre-K through 8 and expand CS opportunities at all district high schools.
- Black Girls Code provides girls of color with opportunities to learn skills in computer programming through workshops, after-school programs, and Hackathons.
- Alliance for California Computing Education for Students and Schools (ACCESS) is a statewide network of computer scientists, teachers, policy advocates, & industry professionals dedicated to providing all CA students with high-quality CS education, specifically for traditionally underrepresented students.
  - Engaged in tracking, supporting, & monitoring implementation of bills and ensuring that CA's CS education legislation will fulfill its potential.

Examples of CA initiatives addressing gaps in access

- Oakland Unified School District & Level Playing Field Institute co-founded a Computer Science Working Group (administrators, non-profit partners, & district math, science, and CS teachers).
  - Worked collaboratively to assess CS assets and challenges, pilot CS professional development, and offer recommendations to strengthen CS throughout the district.
- CA chapters of the Computer Science Teachers Association work to develop strong communities of CS teachers. The organization supports CS teaching & provides opportunities for K-12 teachers and students.
- CA Governor Jerry Brown signed bills AB 1764, SB 1200 and AB 1539 in support of expanding CS education.
  - AB 1764 would allow California schools districts to award students math credit for a UC-approved course in computer science.
  - SB 1200 calls on the University of California and California State University systems to develop guidelines for high school computer science courses that would satisfy advanced math subject matter requirement for undergraduate admissions.
  - AB 1539 calls on the Instructional Quality Commission to consider developing K-12 computer science content standards.
  - 2015 legslation includes district grant funding programs, a community college CS enrollment initiative, and proposed "Women and Girls in STEM" Week.

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Thank you!

For more information about this study, or related research and STEM programming for high-school students:

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