Path not found

Disparities in Access to Computer Science Courses in California High Schools

Level Playing Field Institute

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LPFI MISSION STATEMENT: Level Playing Field Institute is committed to eliminating the barriers faced by underrepresented people of color in science, technology, engineering and math (STEM) and fostering their untapped talent for the advancement of our nation.

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Foreword

This report is released in the wake of national protests against discriminatory police actions that devalue the lives of young people of color. For the first time in more than a generation, mass mobilizations have brought the daily struggles of these young men and women to the halls of the Department of Justice and to the center of our national conversation.

At the same time, communities of color have developed digital-age tactics to grapple with inequities in public safety, housing, healthcare, education, and employment. Digital media tools such as the #BlackLivesMatter hashtag highlight injustices in the experiences of people of color in the United States. Programs like Hands Up United Tech Impact have begun providing computer science exposure for youth of color in Ferguson and beyond, and have created opportunities for underrepresented groups to become producers of new technologies, not merely consumers.

Since 2001, the Level Playing Field Institute has worked to identify and eliminate the barriers faced by underrepresented populations in science, technology, engineering and mathematics. Our work takes on a greater urgency today. Last fall, for the first time in history, students of color made up the majority of first graders nationwide.

Given this backdrop, disparities in computer science education in public schools will not only widen the opportunity and achievement gap, they threaten to have a profound negative economic impact as technology takes on an increasingly central role in the economy. *Path Not Found* exposes these disparities in California public high schools and presents a roadmap for lawmakers, educational programs, the tech community, and school districts to make a crucial course correction.

Benjamin Todd Jealous
Board Member, Level Playing Field Institute
Partner, Kapor Capitol

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Executive Summary

Twenty-first century careers and economic growth in the United States are increasingly dependent upon computing expertise. In California, the home of Silicon Valley, the economy is tied to the sustainability of its rapidly-growing technology sector. Unfortunately, diversity statistics among leading Silicon Valley technology companies indicate that the technology workforce is overwhelmingly white and male, while women and people of color are greatly underrepresented relative to their proportion of the population. With the changing racial landscape of the state and the nation, the lack of diversity within computing fields suggests there is a large pool of untapped talent which comprises a critical component of the future computing workforce.

Given the rising demand for skilled computer science professionals in California, it is vital that the state's public schools provide all students with a solid foundation in computer science coursework. However, California's school system is failing to prepare its students—particularly low income students and students of color—for the technology jobs of the future.

Path Not Found exposes one of the foundational causes of underrepresentation in computing: disparities in access to computer science courses in California's public high schools. The Level Playing Field Institute conducted analyses to disaggregate current computer science offerings by student demographic variables. This report illuminates vast disparities in access to computer science courses in California public high schools by race, socioeconomic status, and linguistic background, and finds that computer science courses are offered at consistently higher rates in schools with student populations that are already disproportionately represented in the computing sector.

This report contains several key findings:

The availability of AP Computer Science courses is considerably higher in schools with lower populations of underrepresented students of color. Further, the higher a school's percentage of underrepresented students of color, the lower the likelihood of a school offering any computer science courses whatsoever.

- 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.
- 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.

California public high schools with high percentages of low-income students have overwhelmingly fewer opportunities to take computer science courses.

- 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.
- 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.

Disparities in computer science course availability can also be seen when examining the percentage of English learners within a school's 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.
- 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.

Computer science course availability is also low within the largest California schools districts, most of which serve high populations of students of color and low-income students.

- **10** out of the largest **20** districts in California do not offer AP Computer Science.
- **5** out of the largest **20** districts in California do not offer any computer science courses.
- Of the 560,874 high school students in the largest 20 California districts, just **1%** (8,136) are enrolled in any computer science course.

In a region at the forefront of technological innovation, opportunities to join the fastest-growing industries must be available to all students regardless of race, ethnicity, primary language, or socioeconomic status.

Reducing disparities in access to computer science coursework requires state, district, school, and community-level funding and policy commitments. This report suggests the following recommendations:

1. Develop state-level and district-level funding strategies to create equitable access to both introductory and Advanced Placement computer science coursework across all California public high schools.
2. Ensure all California school districts allow computer science to count as either a mathematics or science high school graduation requirement.
3. Develop a statewide shared definition of what courses constitute "computer science" for use in all California high schools, in order to create consistency as well as transparency in access.
4. Ensure introductory computer science courses provide the necessary scaffolding and effective instruction for students of all backgrounds to succeed in advanced computing coursework.
5. 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.
6. Expand and strengthen the state's computing teacher workforce by adopting recently-proposed modifications to California's computing-related supplementary authorization so that fully credentialed teachers in subjects other than mathematics can teach computer science with the proper training and preparation.
7. Expand and institutionalize 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, guest speakers, or classroom teaching assistants (from underrepresented backgrounds when possible).
8. Expand access to in-school and out-of-school programs designed to develop computing interest among underrepresented groups, particularly through hands-on projects, field trips, extracurricular activities, and mentorship programs. Ensure funding prioritizes programs serving low-income students of color and other underrepresented groups.

Introduction

"No other subject will open as many doors in the 21st century, regardless of a student's ultimate field of study or occupation, as computer science."

-Computer Science Teachers Association, Running on Empty: The Failure to Teach K–12 Computer Science in the Digital Age

The stakes for broadening participation in computing and the technology sector have never been higher. Computing and technology occupations continue to be among the highest-paying and fastest-growing occupations, growing twice as fast as the average rate for all fields.[1] Recent technological advances driving the state and national economy across many industries can be linked to the field of computer science. Economic projections indicate that there will be more than 1.3 million job openings in computing and mathematical occupations by 2022.[2] In California, the home of Silicon Valley—where the economy is tied to the sustainability of its technology sector—rapid job creation and growth in productivity are increasingly present within computing industries.

Simultaneously, recent releases of employment diversity statistics among leading Silicon Valley technology companies (situated in one of the most diverse states in the nation) indicate that the technology workforce is overwhelmingly white and male, while women and people of color are greatly underrepresented relative to their proportion of the population.[3] This underrepresentation is concerning for several reasons. Research has demonstrated that diverse groups and teams are associated with increased success and innovation,[4] which not only impacts continued economic success of the technology industry but also has implications for creating innovative technological solutions to tackle major societal problems affecting all segments of society. Additionally, with the rapidly changing racial landscape of the state and the nation, the lack of diversity within the computing fields suggests there is a large pool of untapped talent which comprises a critical component of the future computing workforce. Finally, the underrepresentation of diverse groups within the technology industry greatly affects future economic opportunities for communities of color.

Path Not Found exposes one of the foundational causes of this underrepresentation: disparities in access to computer science courses in California's public high schools. Previous reports[5] have demonstrated disparities in participation on the Advanced Placement (AP) Computer Science exam or have examined A-G computer science courses[6] that may not actually be currently taught in schools. The Level Playing Field Institute expanded on these prior analyses by utilizing data on the range of computer science courses currently being taught in California public high schools and conducting analyses to disaggregate access to courses by student demographic variables. Hence, this report illuminates vast disparities in access to computer science courses in California public high schools by race, socioeconomic status, and linguistic background.[7] *Path Not Found* concludes with a description of promising practices

1 Lacey, Alan, and Benjamin Wright. 2010. "Occupational Employment Projections to 2018." *Monthly Labor Review, US Bureau of Labor Statistics.*
US Bureau of Labor Statistics. 2013. "Employment Projections Program: Employment by Detailed Occupation."

2 Richards, Emily, and David Terkanian. 2015. "Occupational Employment Projections to 2022." *Monthly Labor Review, US Bureau of Labor Statistics.*

3 Gilpin, Lyndsey. 2015. "Diversity in Tech: 10 Data Points You Should Know." *Tech Republic, February 4, 2015.*

4 Hunt, Vivian, Dennis Layton, and Sara Prince. 2015. "Why Diversity Matters." McKinsey & Company, January.

5 Bernier, D., Chris Stephenson, Debra Richardson, and Gail Chapman. 2012. "In Need of Repair: The State of Computer Science Education in California." California Computing Education Advocacy Network, January.
California STEM Learning Network. 2014. "Computer Science Education in California." September.

6 University of California Office of the President approves a set of high school courses, known as "A-G" requirements, that students must complete to be minimally eligible for admission to the University of California and California State University systems. Approval of a course put forth by a particular school, however, does not guarantee that the course will be offered.

7 It is important to note that throughout this report, "access" is defined as course availability. However, research has shown that even if a computer science course is offered at a school, it may not, in fact, be accessible for many populations of students due to scheduling constraints or lack of teacher/counselor guidance. For more on access issues beyond the availability of courses, see: Margolis, Jane, Rachel Estrella, Joanna Goode, Jennifer Jellison Holme, and Kim Nao. 2008. *Stuck in the shallow end: Education, race, and computing. Cambridge: MIT Press.*

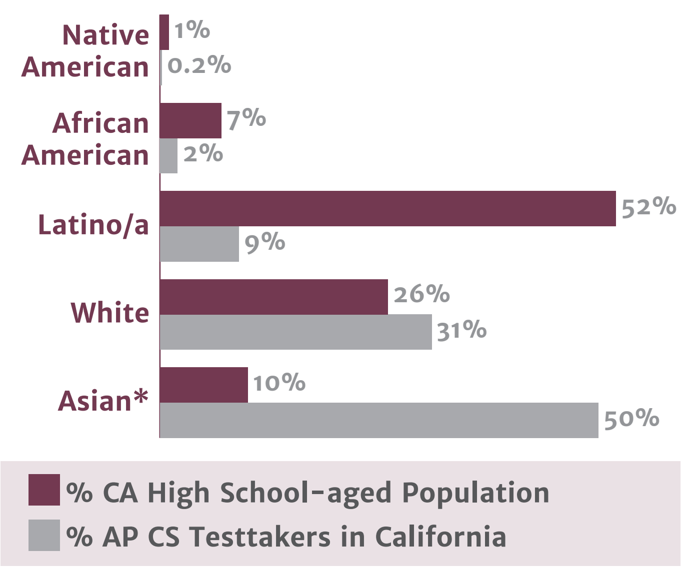
and a set of statewide recommendations to promote equitable access to computer science for all students. By addressing these disparities in access to computer science courses, more equitable pathways to the fastest-growing industries will be created, thus providing growth and sustainability opportunities for communities of color, the technology industry, and the nation's economy.

Underrepresentation in Computer Science

Given the rising demand for skilled computer science professionals in California, it is vital that the state's public schools provide a solid foundation in computer science coursework. Yet, California's school system is failing to prepare its students—particularly low income students and students of color—for the technology jobs of the future. Across the state, **65%** of public high schools offer **no** computer science courses. Further, only **13%** of California public high schools offer the AP Computer Science course, and just 6,676 of the state's 1.95 million high school-aged students (**.03%**) took the AP Computer Science exam in 2014.[8] AP Computer Science is critical to exposing and preparing students to major in computer science in college, and research indicates that without access to advanced computer science courses in high school, students are eight times less likely to pursue computer science in higher education.[9] Despite the fact that African American and Latino students comprise a combined 59% of the high-school aged population in California,[10] a combined total of only 731 African American and Latino students took the AP Computer Science exam in 2014, representing just 11% of the state's total AP Computer Science testtaking population.[11]

FIGURE 1

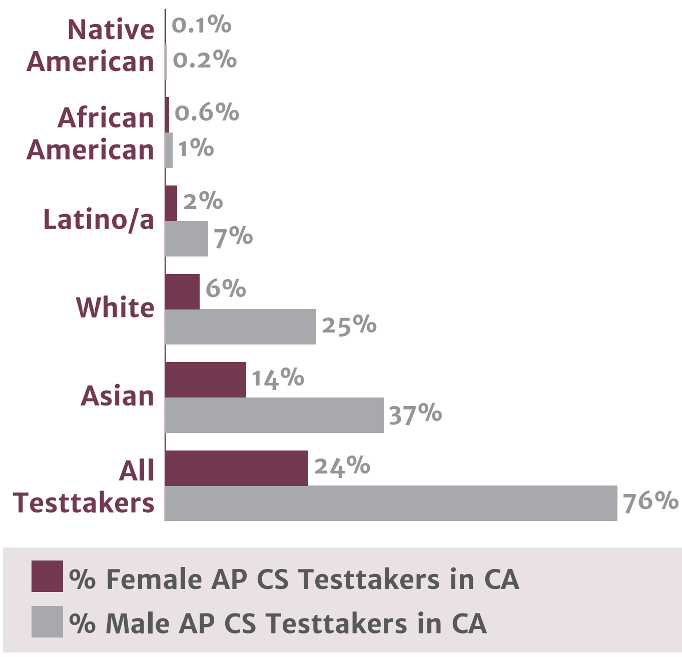
Percentage of AP Computer Science Test-takers and Statewide HS Population, by Race/Ethnicity



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

FIGURE 2

Percentage of AP Computer Science Test-takers, by Gender and Race/Ethnicity



8 College Board. 2014. "AP Program Participation and Performance Data, State Report: California." California Department of Education. 2015. "Fingertip Facts on Education in California - CalEdFacts."

9 Mattern, Krista, Shaw, Emily, and Ewing, Maureen. 2011. *Advanced Placement Exam Participation. 6th ed. College Board.*

10 California Department of Education, Educational Demographics Unit. 2014. "Statewide Enrollment by Ethnicity."

11 College Board. 2014. "AP Program Participation and Performance Data, State Report: California."

Research consistently indicates that women and people of color are severely underrepresented among those taking computer science courses, pursuing and completing computer science Bachelor's, Master's and Doctorate degrees, and those participating in the computing workforce. In post-secondary education, African American and Latino students combined account for just 17% of all computer science Bachelor's degrees conferred, 7% of all computer science Ph.D.'s conferred, 6% of Computer Science faculty, and ultimately just 9% of the computing workforce nationwide.[12]

Numerous causes of underrepresentation in computer science have been identified, including: lack of access to rigorous computer science courses,[13] lack of engaging and culturally relevant computing curriculum,[14] lack of diverse role models and peer networks,[15] negative racial and gender stereotypes about ability,[16] implicit bias and unwelcoming classroom, lab, and workplace environments.[17] While acknowledging the multifaceted barriers affecting participation in computer science among underrepresented groups, this report addresses the fundamental barrier of access to computer science coursework within California's public high schools.

Disparities in Access to Computer Science Courses

Detailed analyses of California Department of Education course, school, and district data[18] revealed that access to computer science courses in California public high schools significantly varies by student demographics, with the majority of schools with high populations of underrepresented students of color[19] and/or low-income students significantly less likely to offer computer science courses.[20]

Race/Ethnicity

As illustrated in Figure 3, while only a fraction of California's public high schools offer AP Computer Science, the availability of these courses is much higher in schools with lower populations of underrepresented students of color. Further, the higher a school's percentage of underrepresented students of color, the lower the likelihood of a school offering any computer science courses whatsoever.

12 National Science Foundation, National Center for Science and Engineering Statistics. 2015. "Women, Minorities, and Persons with Disabilities in Science and Engineering."

13 Margolis, Jane, Rachel Estrella, Joanna Goode, Jennifer Jellison Holme, and Kim Nao. 2008. *Stuck in the shallow end: Education, race, and computing. Cambridge: MIT Press.*

14 Ryoo Jean, Jane Margolis, Clifford Lee, Cueponcaxochitl Sandoval, and Joanna Goode. 2013. "Democratizing computer science knowledge: transforming the face of computer science through public high school education." *Learning, Media and Technology*. 38(2), 161-181.
Scott, Kimberly, Gregory Aist, and Denice Hood. 2009. "CompuGirls: Designing a Culturally Relevant Technology Program." *Educational Technology*, 49(6), 34-39.

15 Cain, Curtis. 2012. Underrepresented Groups in Gender and STEM: The Case of Black Males in CISE. *Proceedings of the 50th annual conference on Computers and People Research, 97-102.*
Zimmerman, Thomas, David Johnson, Cynthia Wambsgans, and Antonio Fuentes. 2011. "Why Latino high school students select computer science as a major: Analysis of a success story." *ACM Transactions on Computing Education. 11(2).*

16 Aronson, Joshua and Claude Steele. 1995. "Stereotype Threat and the Intellectual Test Performance of African-Americans." *Journal of Personality and Social Psychology*, 69(5), 797-811.

17 Cheryan, Sapna, Paul Davies, Victoria Plaut, and Claude Steele. 2009. "Ambient belonging: How stereotypical cues impact gender participation in computer science." *Journal of Personality and Social Psychology*, 97(6), 1045-1060.

18 Level Playing Field Institute analyzed California Basic Educational Data System/California Longitudinal Pupil Achievement Data System computer science course offerings for the 2013-14 school year, provided by the California Department of Education, as well as publicly available school/district demographic data to produce this report. With the exception of alternative/continuation schools, and schools with fewer than 100 students, all California public high schools were included in analyses. This analysis is based on the most accurate data available, though there may be reporting errors from schools or districts.

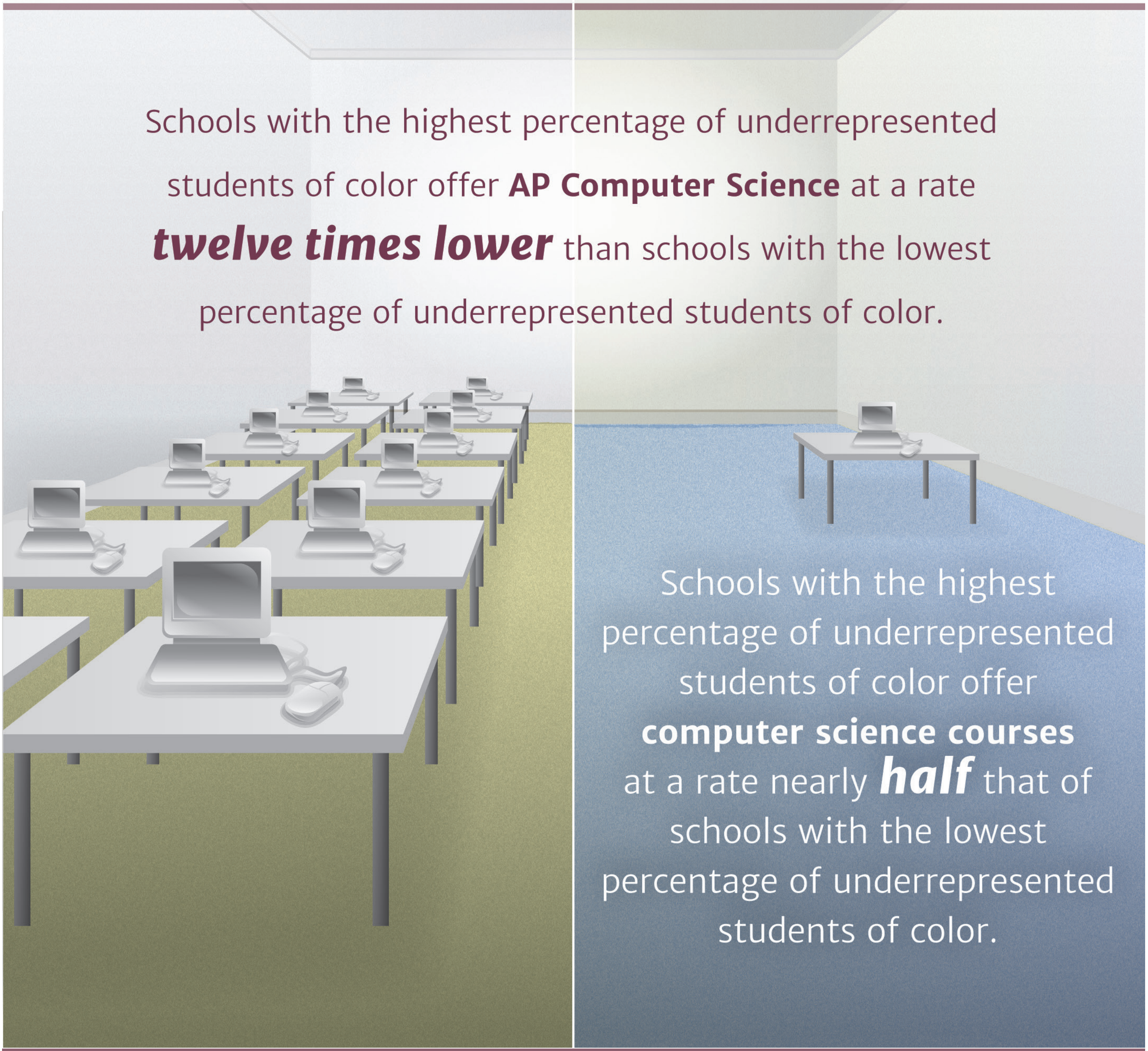
19 Defined as percentage of student body that is African American, Latino/a, and/or Native American; while disparities exist within Asian and Pacific Islander populations, there is not sufficient data to disaggregate by subgroups within these categories. Percentage cutoffs were adapted from the UCLA Civil Rights Project definition of school segregation.

20 Throughout this report, the term "any computer science course" refers solely to courses with either "computer science" or "computer programming" in the title (includes: Computer Science, Computer Programming, Advanced Placement Computer Science, Computer Operations Science, and Exploring Computer Science), in order to focus on the academic discipline of computer science. Computer science does not include the often conflated computer-based courses on information technology and computer literacy and usage (e.g., Networking, Information Technology, Animation, Computer Literacy/Lab, among others). This was informed by the Computer Science Teachers Association's definition of Computer Science Education. See also: CSTA Computer Science Standards

FIGURE 3

Computer Science Availability by Underrepresented Student Population

Computer science course ***availability is considerably lower*** in California public high schools that have ***high populations 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%**

Income

The socioeconomic status of a school's student population is also associated with access to computer science courses. California public high schools with high percentages of low-income students[21] have overwhelmingly fewer computer science opportunities (Figure 4).

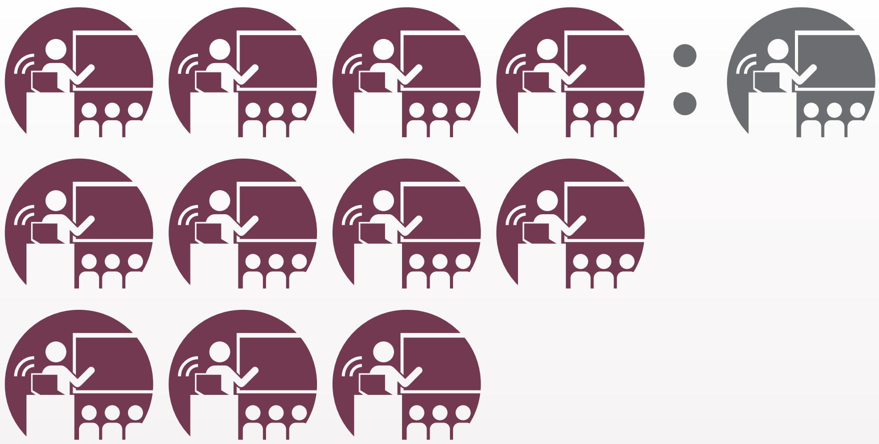
FIGURE 4

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%**

21 As defined by Free/Reduced Price Lunch eligibility (through federally-determined poverty guidelines) for the National School Lunch Program.

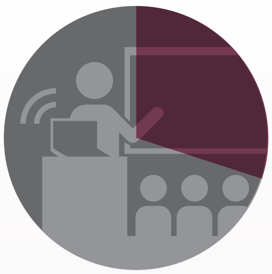
Language Learners

Disparities in computer science course availability can also be seen when examining the percentage of English learners[22] within a school's student population (Figure 5).

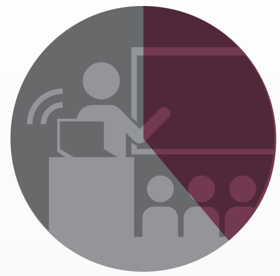
FIGURE 5

Computer Science Availability by English Learner Status

HIGH % ENGLISH LEARNERS IN STUDENT POPULATION

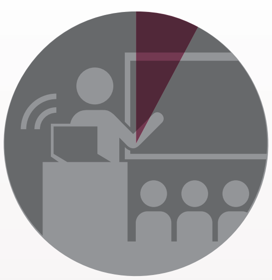


LOW % ENGLISH LEARNERS IN STUDENT POPULATION

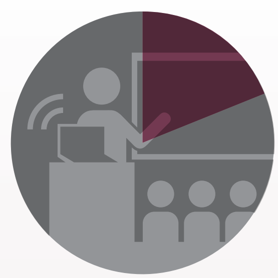


Just **31%** of schools with a high percentage of English learners (11% or above) offer **any computer science courses.** In contrast, **39%** of schools with a low percentage of English learners (10% and below) offer any computer science courses.

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%**

22 "English learner" students, as defined by the California Department of Education, have a primary language other than English on the state-approved Home Language Survey and lack the defined English language skills of listening comprehension, speaking, reading, and writing necessary to succeed in traditional instructional programs.

Computer Science in California's Largest Districts

Table 1 lists student enrollment in computer science courses for the largest California schools districts, most of which serve high populations of students of color and low-income students. Though these districts educate a combined total of **over one-quarter (29%)** of California's high school-aged students, they offer few opportunities for students to access computer science coursework.

- **10 out of the largest 20** districts in California do not offer AP Computer Science.
- **5 out of the largest 20** districts in California do not offer any computer science courses.
- The district with the highest percentage of underrepresented students of color in Table 1 (Santa Ana; 96% underrepresented students of color) has **zero students** enrolled in any computer science courses.
- Of the 560,874 high school students in the largest 20 California districts, just **1%** (8,136) are enrolled in any computer science course.

TABLE 1

Computer Science Course Enrollment[23] in Largest California School Districts[24]

District Name	High School Enrollment	% Free/ Reduced Price Lunch Student Population	% Under-represented Students of Color	# of Students Enrolled in AP Computer Science	# of Students Enrolled in any other Computer Science course[25]	Total % of Students in District Enrolled in Computer Science courses
Los Angeles Unified	198,180	79%	83%	166	6,131[26]	**3%**
San Diego Unified	38,549	67%	55%	160	3	**.04%**
Kern High School District	37,086	54%	69%	0[27]	0	**0%[27]**
Sweetwater Union High	28,947	55%	77%	0[27]	60	**.02%[27]**
Long Beach Unified	26,103	67%	70%	51	0	**.01%**
Fresno Unified	21,057	92%	75%	23	66	**.04%**
Elk Grove Unified	19,405	60%	42%	0	152	**.07%**
San Francisco Unified	18,548	64%	33%	136	351	**3%**
Corona-Norco Unified	17,521	44%	57%	38	0	**.02%**
Capistrano Unified	17,273	24%	26%	60	36	**.05%**
Santa Ana Unified	16,838	91%	96%	0	0	**0%**
San Bernardino City Unified	15,601	94%	88%	0	206	**1%**
San Juan Unified	16,411	50%	28%	0	0	**0%**
Garden Grove Unified	14,881	70%	54%	67	0	**.04%**
Riverside Unified	13,803	64%	66%	1	172	**1%**
Sacramento City Unified	13,038	68%	54%	0	87	**.06%**
Fontana Unified	12,863	87%	91%	0	0	**0%**
Clovis Unified	12,624	42%	36%	0	0	**0%**
Oakland Unified	12,096	77%	69%	28[28]	72[28]	**.08%**
Stockton Unified	10,050	83%	75%	0	70	**.06%**

23 Most recent available enrollment data, from 2012-13 school year.
24 Districts in California with the top 20 overall student enrollment, arranged by largest high school population. *Source: California Department of Education. (2014). "District Enrollment by Grade."*
25 See footnote 20 for description of included courses.
26 Includes 2014-15 Exploring Computer Science (ECS) enrollment numbers, obtained from ECS program.
27 District has added one AP Computer Science course since this data was released, though enrollment numbers are not yet available.
28 2014-15 enrollment numbers, obtained from OUSD Research and Evaluation Department.

Conclusion and Recommendations

In addition to the broad lack of access to computer science courses affecting all students in California's public high schools, significant inequities in access to computer science exist by student demographics. In a region at the forefront of technological innovation, opportunities to join the fastest-growing industries must be available to all students regardless of race, ethnicity, primary language, or socioeconomic status. Democratizing access to computer science knowledge, however, is more than just an imperative to improve economic and workforce outlooks. Computing is truly a 21st century skill; computer science exposure—when rooted in culturally relevant instruction and rigorous standards—has the potential to foster critical inquiry and develop problem solving abilities that transcend the study of computer science and are highly relevant for all fields of study.[29]

Broad and coordinated efforts are needed to reverse disparities in computer science access, particularly for underrepresented students of color and low-income students across the state of California. To address disparities in computer science opportunity, this report highlights promising practices and suggests the following recommendations:

1. Develop state-level and district-level funding strategies to create equitable access to both introductory and Advanced Placement computer science coursework across all California public high schools.
2. Ensure all California school districts allow computer science to count as either a mathematics or science high school graduation requirement.
3. Develop a statewide shared definition of what courses constitute "computer science" for use in all California high schools, in order to create consistency as well as transparency in access.
4. Ensure introductory computer science courses provide the necessary scaffolding and effective instruction for students of all backgrounds to succeed in advanced computing coursework.
5. 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.
6. Expand and strengthen the state's computing teacher workforce by adopting recently-proposed modifications to California's computing-related supplementary authorization so that fully credentialed teachers in subjects other than mathematics can teach computer science with the proper training and preparation.
7. Expand and institutionalize 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, guest speakers, or classroom teaching assistants (from underrepresented backgrounds when possible).
8. Expand access to in-school and out-of-school programs designed to develop computing interest among underrepresented groups, particularly through hands-on projects, field trips, extracurricular activities, and mentorship programs. Ensure funding prioritizes programs serving low-income students of color and other underrepresented groups.

29 Goode, Joanna, Jane Margolis, and Gail Chapman. 2014. "Curriculum Is Not Enough: The Educational Theory and Research Foundation of the Exploring Computer Science Professional Development Model." In *Proceedings of the 45th ACM Technical Symposium on Computer Science Education: 493–98.*

Promising Practices

A number of programs and initiatives across California—both in and out of schools—aim to address gaps in access to computer science courses and provide opportunities for exposure and engagement in computer science.[30]

District and School-Level Initiatives

- Los Angeles Unified School District partners with the Exploring Computer Science program to provide curricula and professional development to educators teaching the year-long Exploring Computer Science course at nearly 40 LAUSD high schools, exposing over 2,300 high schools students-the majority of whom are from groups traditionally underrepresented in computer science-to an engaging and culturally relevant computer science curriculum. This program has achieved strong outcomes and has impacted student interest in computer science.
- Los Angeles Unified School District has also begun a partnership with Code.org in order to offer computer science to grades K-8 and to expand high school computer science course offerings. Code.org additionally partners with a number of districts and schools across the state of California.
- San Francisco Unified School District also partners with Code.org to broaden computer science access. Additionally, SFUSD is crafting an initiative to make computer science compulsory for all students in grades Pre-K through 8 and to expand computer science opportunities at all district high schools.
- Oakland Unified School District, in partnership with Level Playing Field Institute, co-founded a Computer Science Working Group comprised of administrators, non-profit partners, and district math, science, and computer science teachers. This group worked collaboratively to assess computer science educational assets and challenges, to pilot computer science professional development programs, and to offer specific recommendations aimed at strengthening computer science offerings throughout the district.
- In order to create new AP Computer Science courses, teachers at Castlemont High School in Oakland and Lincoln High School in San Jose undertook successful crowdfunding campaigns to buy laptops and equipment, and partnered with the Technology Education And Literacy in Schools program to bring tech professionals into classrooms as volunteer instructors.
- California chapters of the Computer Science Teachers Association work to develop strong communities of computer science teachers. The organization supports the teaching of computer science and provides opportunities for K-12 teachers and students.

Out-of-School Opportunities

- Level Playing Field Institute implements computer science initiatives in Northern and Southern California designed to provide underrepresented students opportunities for exposure, engagement, and technical skill development within the field of computer science. These programs include National Science Foundation-funded rigorous computer science coursework for 9-12th grade students in SMASH (Summer Math and Science Honors Academy), computer science exposure for African-American middle school boys in SMASH: Prep, and Hackathons to increase exposure and "Level the Coding Field" for 6-12th grade students.
- Black Girls Code provides girls of color with opportunities to learn skills in computer programming through workshops, after-school programs, and Hackathons.
- Teens Exploring Technology offers programs for young men of color to learn computer programming in summer coding academies designed to develop technology leaders.
- Hidden Genius Project trains African-American young men in technology creation, entrepreneurship, and leadership skills in order to transform their communities and create career pathways.
- Latinos in Tech Innovation and Social Media aims to empower Latinos in the areas of health, education, and civic engagement through tech innovation.
- Yes We Code helps prepare youth to become computer programmers, with the goal of training 100,000 young people.

30 While it is beyond the scope of this report to present each program in California, several examples are highlighted as models for increasing computer science access and opportunity.

University-Level Initiatives

- Computer science researchers from Santa Clara University received National Science Foundation funding to establish Exploring Computer Science at 10 public high schools in the San Jose area. Results show an encouraging correlation for Exploring Computer Science participants versus their peers in attendance rates and mathematics test scores.
- University of California, Berkeley instructors who developed the popular "Beauty and Joy of Computing" (BJC) class have created an online version of the course, called BJCx, launching September 2015. BJC was twice chosen as a national pilot for the upcoming Advanced Placement Computer Science Principles course designed to broaden participation in groups traditionally underrepresented in computing.
- Computing Principles for All Students' Success, a collaboration between The University of California, San Diego, San Diego State University, the San Diego chapter of the Computer Science Teachers Association, and K-12 schools throughout San Diego, aims to build local capacity and sustained professional development for a regional community of high school Computer Science Principles teachers.

Policy and Advocacy

- Expanding Computing Education Pathways Alliance, of which California is a state partner, seeks to increase the number and diversity of students in the educational pipeline to computing by supporting state-level computing education reforms.
- In September 2014, California Governor Jerry Brown signed bills AB 1764, SB 1200 and AB 1539 in support of expanding computer science 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. New legislation introduced in 2015 includes district grant funding programs for computer science coursework and professional development, a community college concurrent computer science enrollment initiative, and a proposed "Women and Girls in STEM" Week to encourage and celebrate women in the fields of science, technology, engineering, and mathematics.
- Alliance for California Computing Education for Students and Schools (ACCESS) is a statewide network of computer scientists, K-12 teachers, professors, educational policy advocates, and industry professionals dedicated to providing all California students with high-quality computer science education, ensuring that computer science education is available to all students, specifically for traditionally underrepresented students including girls, low-income students, and students of color. ACCESS is engaged in tracking, supporting, and monitoring the implementation of bills and ensuring that California's computer science education legislation will fulfill its potential for expanding participation in computer science and ensuring its accessibility to all students.

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