# Disparities in Students' Experience of Computer Science are Exacerbated when Considering Who Does and Does Not Take Advanced Placement Exams

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## Executive Summary

Texas students from traditionally marginalized race/ethnicity groups are not having equitable learning experiences in high school computer science (CS) courses. Our findings demonstrate disparities in both Advanced Placement (AP) CS exam taking and performance for students who belong to these groups and have important implications for whether students receive college credit for taking AP CS in high school.

Specifically, we investigated differences in students' learning experiences by analyzing AP CS test taking and passing rates, disaggregated by race/ethnicity. We found that Asian and White students both took AP CS exams at higher rates and passed AP CS exams at higher rates than their Hispanic/Latino and Black peers. Policymakers should consider how school accountability systems related to AP courses may have unintended consequences that prevent students from taking AP exams and how barriers, such as cost, may be preventing students from taking exams for the AP courses in which they are enrolled.

## What We Studied

Equitably expanding K-12 computer science (CS) education is essential for preparing a diverse group of students to meet the growing computing workforce needs. Understanding the systemic inequities in CS education requires measuring equity at multiple levels. The CAPE framework (Fletcher & Warner, 2021) conceptualizes equity in terms of capacity for, access to, participation in, and experience of CS education. In the work represented here, we utilized the CAPE framework to better understand disparities in the student experience of CS courses.

Many efforts to address equity in CS education center on increasing enrollment of students who belong to groups historically marginalized in CS (including Black and Hispanic/Latino students). However, increased participation does not mean that students are having positive experiences in CS (Margolis et al., 2012). Focusing on equity of experience is important for ensuring that curricula and instructional practices are culturally responsive, all students have CS self-efficacy and a sense of belonging in CS, and learning outcomes are favorable for all groups of students.

Examining disparities in student learning outcomes using Advanced Placement (AP) test scores and passing rates, disaggregated by race/ethnicity and gender, has been a primary method for assessing equity of student experience in CS courses. One such analysis found that AP CS A exam passing rates for Hispanic/Latino (40%) and Black (39%) students in California were lower than those of their Asian and White peers (over 75%), highlighting inequities in CS learning experiences by race/ethnicity (Scott et al., 2019).

AP CS exam scores are a good starting place for understanding students' learning experiences, but they do not provide a full picture. We extended prior work examining disparities in AP CS exam scores by also examining which students

enrolled in AP CS courses actually took an AP CS exam and which did not. In this study, we exmained percentage of students enrolled in AP CS A and AP CS Principles (AP CS P) who took an AP CS exam and how those students performed on the exam, and we explored differences by student race/ethnicity.

**Research Question**

1. What, if any, differences exist between subgroups of students based on race/ethnicity with respect to the percentage of AP CS course enrollees who take and pass an AP CS exam?

## How We Analyzed the Data

We used Texas 2018-19 AP CS exam data from the College Board and course enrollment data from the Texas Education Research Center (ERC) to answer this question. Data from the College Board were publicly available and provided the number of students who took an AP CS exam and the number who received each score (on a scale from 1 to 5) disaggregated by race/ethnicity and state. From these data, we calculated the percent of AP CS A and AP CS P exam takers in Texas who scored a three or above on the exam (i.e., a passing score). This is the same calculation for AP exam passing rates that is often used to examine disparities in student performance.

We took this analysis a step further using the Texas ERC data on AP CS A and AP CS P course enrollment, disaggregated by race/ethnicity, to explore disparities in AP exam passing rates in the context of which course enrollees actually took an AP CS exam. Using these datasets together, we calculated the percentage of students enrolled in each AP course and the percentage who passed each AP exam.

## What We Discovered

From the College Board data alone, we found disparities in passing rates much like those noted by other researchers. Specifically, when compared to their Hispanic/Latino and Black student peers, a larger percentage of Asian and White students scored a three or higher on AP CS A and AP CS P exams. This analysis of exam performance data evidences inequities in students' experiences of CS, but coupling these data with AP CS A and AP CS P course enrollment data (from the Texas ERC) to view them in the context of who among course enrollees took AP CS exams allowed us to uncover even more pronounced disparities in passing rates.

Together, the data again show Hispanic/Latino and Black students scored lower on both AP CS A and AP CS Principles exams, but they were also not as likely as their Asian and White peers to even take an AP CS exam (see Figure 1). In other words, Asian and White students both took AP CS exams at higher rates and passed AP CS exams at higher rates than Hispanic/Latino and Black students. Of students enrolled in AP CS A, almost 90% of Asian and White students took the AP CS A exam, while only 76% of Hispanic/Latino and 66% of Black AP CS A students did the same. Additionally, less than half of Hispanic/Latino and Black AP CS A students who took the exam scored a three or higher. In contrast, the biggest disparity in AP CS Principles exam taking was between Asian and Black students enrolled in the course, with 74% of the former and only 46% of the latter taking the exam.
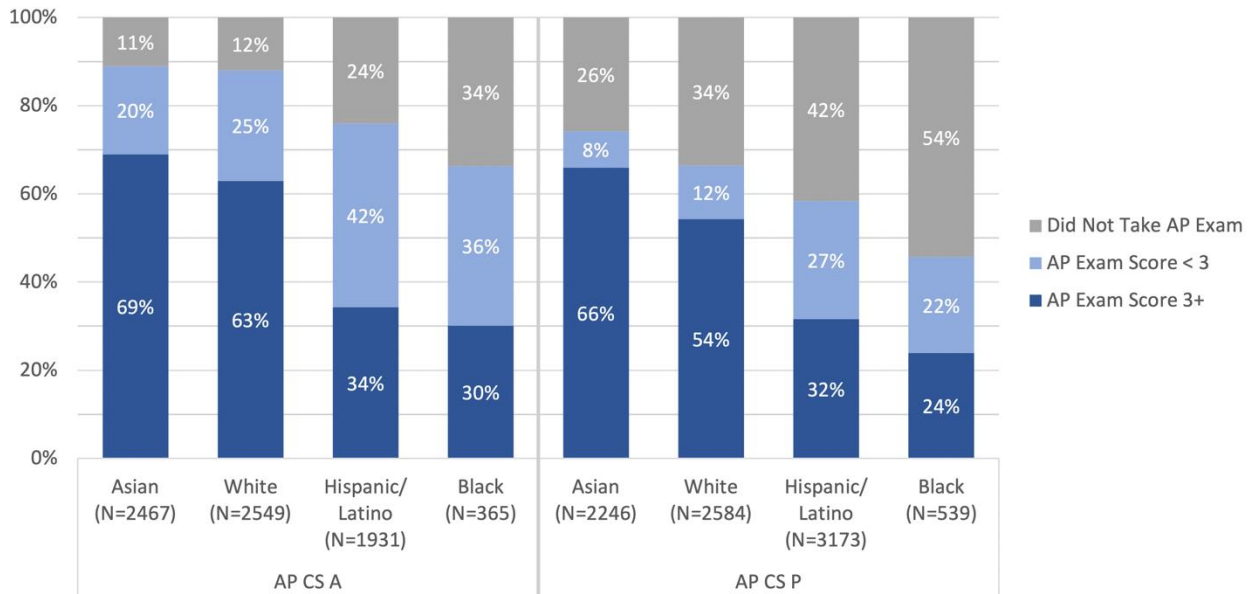
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Figure 1. Exam-taking and performance by race/ethnicity for students enrolled in AP CS A and AP CS P

## Policy Recommendations

These data demonstrate disparities in both AP CS exam taking and performance for students from traditionally marginalized race/ethnicity groups and have important implications for whether students receive college credit for taking AP CS in high school. We view these data as lagging indicators of students' experiences in CS courses and education policies that disincentivize students from taking AP CS exams or leave them ill-prepared to perform well.

Educational policies should support positive experiences for all students in CS courses. State policies could encourage enrollment of diverse students in CS courses by giving schools credit or points in accountability systems for having students from traditionally marginalized backgrounds in AP CS and dual credit courses. Policies that give schools accountability credit for students who score a three or above on AP exams could also incentivize schools to ensure that all students enrolled in AP courses have positive and rigorous learning experiences that prepare them for an AP exam. However, if state policies penalize schools for students who do not pass AP exams, schools may only encourage students they think will be successful to take AP exams or even discourage other students from challenging exams. While our data do not tell us whether current policies in Texas discourage certain students from taking AP CS exams, we recommend that policymakers consider unintended consequences of policies on students' experiences in CS. Policymakers should also examine whether policies that subsidize AP exam costs for low-income students are fully addressing the financial barriers of AP exam-taking, as subsidies in some states do not cover the full cost.

*The full version of this study can be found at: https://doi.org/10.1177/14782103221074467*

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