Chapter 6
Minority Students in Computer Science:
Barriers to Access and Strategies to Promote Participation

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ABSTRACT

Over the past decade, a number of collaborative efforts to expand computer science (CS) education in U.S. K-12 schools have been made (e.g., CS 10K and CSforAll). Despite various efforts, minority students, such as African Americans and Hispanics, still face unique barriers to accessing CS courses, resulting in the underrepresentation of minorities in the field of CS. This chapter reviews factors affecting minority students' interest in and access to CS learning and identified barriers, such as a lack of CS courses offered in schools, students' lack of self-efficacy in CS, and a lack of role model who can encourage minority students to study CS in college. The chapter also introduces the culturally responsive teaching (CRT) framework, followed by a discussion on how teachers can incorporate CRT strategies to create culturally responsive computing learning environments where minority students' engagement and success in CS are promoted.

INTRODUCTION

The increasing demand for computer science (CS) related jobs has allowed K-12 schools, universities, government, tech industry, and nonprofit organizations to work together to broaden participation in CS in the United States (Brown & Briggs, 2015). According to the U.S. Bureau of Labor Statistics (2020), employment of computer and information technology jobs is projected to grow about 12 percent from 2018 to 2028, which is much higher than the average growth for all occupations. Expanding CS learning opportunities is more than meeting the employment demand. Margolis and Goode (2016) claim, "Knowledge of computing is important across all types of fields and jobs, but knowledge about computer

science is also a critical component of civic life and democratic participation…. [Computer science] allows one to intervene and innovate in today's world" (p. 52). Similarly, Webb et al. (2017) state that the emphasis on CS is essential to educate active creators and producers who can lead cultural change as opposed to generate passive consumers of technology. In order for a nation to continue to innovate and progress, providing K-12 students with the opportunity to learn CS is important (Google & Gallup, 2016; Yadav, Gretter, Hambrusch, & Sands, 2016).

Over the past decade, a number of collaborative efforts to expand CS learning opportunities have been made, reporting positive results. For instance, *CS 10K* and *CSforAll* initiatives, funded by the National Science Foundation, have allowed new curriculums to be developed. These initiatives have also provided teachers with more professional learning opportunities to learn how to teach CS (Brown & Briggs, 2015; Margolis & Goode, 2016). The New York City (NYC) Department of Education launched the *CS4All* initiative in 2015, and the evaluation survey reported that approximately 55% of NYC schools provided students with some kind of specific CS instruction during the 2016-2017 academic school year (Villavicencio, Fancsali, Martin, Mark & Cole, 2018). According to the College Board (2018), almost 136,000 students took at least one AP CS exam in 2018, a 31% increase from 2017. The number of Black students who took one of AP CS exams increased about 44% from 2017, and the number of Hispanic students increased 41%.

Despite various efforts to provide CS learning opportunities to all K-12 students, minority students, such as African Americans (Black is also used interchangeably in this chapter), Hispanics (Latino is used interchangeably), and American Indians, still face unique barriers to accessing CS courses, resulting in the underrepresentation of minorities in the field of CS in the U.S. (Sax et al., 2018). According to the report by Google and Gallup (2016), Black students (47%) are less likely than their White counterparts (58%) to have CS classes at their schools, and Black (58%) and Hispanic (50%) students are less likely than White peers (68%) to use a computer at home. Despite NYC's effort to diversify students in CS education, more wealthy schools that include fewer minority students reported that they have offered CS instruction, indicating a lack of minority students' opportunities to learn CS (Villavicencio, Fancsali, Martin, Mark & Cole, 2018).

In order to broaden participation and to diversify the future CS field, understanding barriers that minority students face to gain access and ways to promote minority students' interest and participation in CS is critical (Goode, 2007; Wang, Hong, Ravitz, & Moghadam, 2016). Consequently, this chapter reviews factors affecting minority students' interest in and access to CS followed by synthesizing various studies and projects promoting minority students' learning of CS. The chapter also introduces culturally responsive teaching and discuss how teachers can incorporate this teaching method to promote minority students' participation and success in CS classes.

UNDERREPRESENTATION OF MINORITY STUDENTS

Barriers to Having Computer Science Learning Experiences

Although African Americans and Hispanics represent 27% of the U.S. population, they only make up 16% of the science, technology, engineering and math (STEM) workforce. In terms of college or advanced degree, just 7% of African Americans and 6% of Hispanics hold a bachelor's degree or higher in a STEM field (Funk & Parker, 2018). This indicates a potential lack of minority role model who can

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