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Power On!

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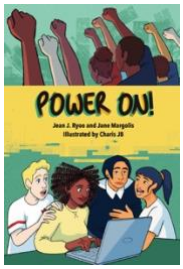

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In the seven-chapter graphic novel *Power On!,* burgeoning computer science students Antonio, Christine, Jon, and Taylor transition from eighth grade to high school, exploring and engaging with computer science topics in rich, authentic, and situated ways that honor the real-world lived experiences of diverse and underrepresented students in STEM.

The first few chapters of the graphic novel establish the vibrant character narratives for each student that will shape their unique computer science experiences at different schools, which feature the thoughtful intersectionality of diverse racial and ethnic backgrounds, representation across the gender and sexuality spectra, and socio-economic factors that can support or hinder computer science learning. As the group discovers and grapples with the concept of racial bias in artificial intelligence (AI) in Chapter 1, their exploration and discussion builds upon each character's complex positionality. For example, upon learning how bias is programmed into AI, Christine becomes concerned about computer systems finding her undocumented family members.

In Chapter 2, the readers are introduced to national and community-level issues that impact the friends' daily lives, including the Black Lives Matter protests and the historical importance of Juneteenth celebrations. This chapter also offers micro-level insight into characters' homes and daily routines, including character-specific interests and pastimes (e.g., makeup, video games), family relationships, expectations and responsibilities, and academic pursuits. Here the graphic

novel adopts a highly effective "show instead of tell" approach to illustrating how students' sociocultural contexts can impact their computer science experiences over time. When Antonio's parents are shown arguing in this chapter, for example, this foregrounds their later divorce, which forces Antonio to take on a part-time job down the line that limits his availability for computer science (CS) pursuits.

In the next chapters, the book takes readers through the friends' first day of school, and their subsequent engagement (or lack of engagement) with computer science in formal learning settings. Potential impacts on students' computer science experience are portrayed, both broadly and more implicitly through the different commutes the friends take to get to their respective schools, to more targeted examples of systemic racism and other microaggressions that they experience in their pursuit of STEM. On her first day in the computer class, a teacher calls Taylor, a Black female student, by her Black classmate's name, Janelle. A student bullies Jon for being gay, and another teacher tells Christine that she appears to be a person who would enjoy her hospitality and tourism class since the computer science class she wanted to transfer into was full. The ways in which these experiences shape the group's long-term computer science outcomes and achievement is often left open to readers' discussions and interpretations, providing potential avenues for educators to use the graphic novel as a teaching tool. As a result, many of these topics are mentioned briefly or in passing, and as such, the work functions as an overview of the computer science fields and the types of affordances and constraints facing underrepresented students. Fortunately, the book includes many links to more detailed resources and break-out vignettes that add content and detail regarding social issues, important CS figures, and culturally specific terms or concepts.

This book continues to educate readers about afterschool programs that seek to fill the school district's gap in computer science education. Taylor and Christine participate in an after-school CS program to gain the coding experience they did not receive in school. When the group notices the differences in their experiences, they agree to teach each other what they learned in class to supplement each other's computing knowledge. Readers learn about the potential of after-school programs and can be inspired to teach their peers about computing.

Power On! shows the complexities of computing classes and the various methods by which teachers can influence students' interests in computer science. While Taylor only learns how to type in her class, Antonio goes on a trip to a video game studio. In this section of the book, readers learn about the different careers that are involved in developing games. The book continues to recognize the lack of diversity in the gaming industry as the students verbalize how, in that studio, they did not see anyone that looked like them.

The technology presented in this book is used in real-life situations as the students explore various types of technologies, e.g., designing for e-textiles, apps, and websites. These examples show readers that computer science doesn't just include typing lines of code on a computer screen. Antonio develops a phone application for his peers to anonymously share their feelings, and Taylor joins an after-school programming class where she works with e-textiles. These projects and the visit to the video game studio show readers the multitude of possibilities for working in the computer science field.

Power On! shows high school audiences that they have the power to create change in their community. To increase the quality of the computer science classes in their school district, the group collects evidence about computer science from their peers and parents to present to their school district. Readers do need to be complicit with the lack of computer science education; they can identify the gaps in their education and develop a plan of action to address these issues.

Where the book really shines is in its multifaceted representation of the experiences of students from diverse racial and ethnic backgrounds. Intersectional experiences based on gender, sexual orientation, and disability status are less integrated into the story, resulting in some identities and experiences being more fully realized. Nonetheless, this graphic novel may be the first opportunity for some readers to see aspects of themselves in computer science through the intentional and authentic inclusion of diverse CS students' lived experiences. This work not only meets CS learners where they are, but also models how they can and should be moving forward: as vibrant contributors to the computer science community as creators, teachers, peer supports, researchers, respectful dissenters, and leaders for change. Couched in this intentional framing, Taylor's discussion of the importance and value of computer science with her mother feels natural and fully realized. Through engagement with *Power On!*, high school students might similarly feel inspired and motivated to learn and lead in computer science.

Author Biographies

MONIQUE WOODARD is a research analyst at Metis Associates. She is an ABD PhD candidate in Education with STEM concentration at Drexel University. Her research focuses on supporting creativity in Black girls as they learn to code virtual environments. During the summers, she designs and runs camps teaching students to code Python environments.

AMANDA BARANY is a postdoctoral scholar for the Louis Stokes Alliance for Minority Participation (LSAMP), working in the School of Education at Drexel University. She is also co-PI for the Broadening Participation in Computing grant "Coding Like a Data Miner: A Culturally Relevant Data Analytics Intervention for High School Students." Amanda has served as a researcher for the past 5 years in the Games and Learning in Interactive Digital Environments (GLIDE) lab, which unifies her research interests in game-based learning, the design of computer-based learning environments, identity, and interest and motivation. Amanda has 10 years of experience studying the design of digital environments for learning. For five years, she worked in the UW Madison psychology department conducting lab studies of college students' developing interest and motivation around science content. She also served as project manager for the educational game Citizen Science at the Games + Learning + Society research and design lab.

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with the systematic design of technological learning experiences that addresses the cognitive, pedagogical, and experiential affordances of technologies, intelligent media design, and personalized learning. He has won awards for his research on technology in teaching and learning, and game-based learning including the prestigious National Science Foundation CAREER award.