

Book Review

Marina Umaschi Bers, *Beyond Coding: How Children Learn Human Values through Programming*. MIT Press, 2022.

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In the digital age, the development of Information Technology has crucially changed the way in which we comprehend the world. While coding was originally perceived as a “privilege” reserved for computer scientists and programmers before, it has gradually become a survival skill for the generation of youth born in the new millennium. In the United States, the public and private sectors have made significant efforts to integrate coding training into K-12 education. As an experienced researcher and practitioner in coding training for kids, Tufts University’s professor of computer science, Marina Umaschi Bers, attempts to transcend the traditional view of coding as merely scientific knowledge and skills. In her newest book, *Beyond Coding* (2022), Bers casts light on the pedagogical potential of computer programming activities for training future responsible citizens.

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The first half of the book outlines Bers' revisionist positioning of coding training in education and surveys the limits of the obsolete STEM model of coding. Chapter 1 begins by addressing the four pillars of Bers' alternative definitions of coding as a “playground,” “another language,” a “palette of virtues,” and a “bridge.” She goes on to discuss how coding activities play the role of a “playground” in kids’ activities, a space in which students can learn collaboration through practicing computer programming. The subsequent chapter shifts to debates between instructional and constructivist approaches to the curriculum of coding. Bers notes, “I use the metaphor of the Coding Wars to tell a story about the confrontation between two opposing views on learning to program.”¹ She reflects on her practice of teaching coding to pre-K children through Scratch-Jr and KIBO robotics and reaches the conclusion that a constructivist approach contributes to kids’ character development. Chapter 3 chronicles the emergence and evolution of “STEM” as an umbrella term in postwar American society. According to Bers, the term originated from “the need to maintain international primacy, a strong economy, and national security” since the Sputnik crisis during the early Cold War. However, the integration of computer science, especially coding, into the cluster becomes problematic in the new millennium. As she addresses, “grouping computer science with STEM subjects restricts the power of coding to a limited group of disciplines, to a limited group of students and teachers, and to the particular demands of the workforce. It limits coding’s power as a true literacy that promotes new ways of thinking and changing the world.”² Bers’ refusal to reduce coding to STEM resonates with her book’s core advocacy for teaching Coding as Another Language (CAL).

After critically reviewing the limits of the traditional STEM model of coding, the remainder of this volume shifts to CAL's pedagogical implications. Featuring the title “From theory to

¹ Marina Umaschi Bers, *Beyond Coding How Children Learn Human Values through Programming* (The MIT Press, 2022), 25.

² *Ibid.*, 58.

practice," Chapter 6 reviews Bers' practice of CAL in young children's coding activities. Chapter 7 transitions to the use of coding activities in promoting children's character development. Bers articulates the extent to which her model of coding could serve this purpose: "CAL proposes an intentional awareness of the values at play when learning to code. Since the palette of virtues is dynamic, it invites educators to incorporate their own colors and to extend and adapt to the needs and cultural practices of their own classrooms."³ As shown in the following chapter, this term refers to an approach to coding as a "playground" to enhance children's character development. The final chapter turns to Bers' metaphor of coding as the bridge between "robotics, culture, and values with children, families, and educators."⁴

Bridging theoretical considerations and empirical research, Bers successfully coheres these two considerations in each chapter. As mentioned above, this book's second half focuses on the practice of coding and its social implications. Bers avoids simply packing case studies, participants' testimonies, and theoretical reflection together but instead organizes this material together in a coherent manner. Taking Chapter 6 as an example, Bers begins with a dialogue between a researcher in her team and a young child named Nancy, and following this, she shifts to assessing the limits of these traditional approaches and the advantages of the CAL approach and finally turns to empirical research. Echoing the quote at its beginning, "Nancy entered the classroom smiling, sat down on her spot on the technology circle, and waited for class to begin," this chapter's primary contribution is its exploration of the interaction between Nancy and the researcher, which resonates with her theoretical assessment.⁵ This emphasis on the conversation between theoretical reflection and real-world scenarios continues throughout the book. With no exceptions, all chapters in this volume conclude with a vignette describing young children's experiences with coding and their communication with Bers' team members in the classroom. Hence, Bers successfully combines and communicates the theoretical reflections and empirical research in the same chapter instead of separating them.

This volume also successfully demonstrates the extent to which the CAL model could contribute to the moral education of pre-K children. Bers convinces readers of the influence of computer programming on students' worldviews and moral considerations "beyond coding." The practice of coding could enable students to learn much about how to live a moral life. In this manner, she treats coding not merely as knowledge but as a style of living. In addition to Bers' metaphor of CAL in reference to acquiring the skill of coding, I would like to address that learning a new language does not simply involve memorizing the alphabet or mastering grammar but also being immersed in a different culture. Originally coming from China, studying in the United States, and using English as my working language, I am aware of the influence of learning a foreign language on my worldview. The acquisition of coding as another language could similarly influence kids. Characterized by collaboration and responsibility, the ethics of coding as a working culture may contribute to kids' moral development.

While Bers bases her CAL thesis on her research among pre-K children, college teachers may also take lessons from her insights. I appreciate Bers' argument for the pedagogical use of programming skills. As I note elsewhere, "college faculty could take seriously how to teach those Twitter and Tik-Tok natives in a more student-friendly way instead of imposing obsolete values on them. College instructors may consider the potential of hybrid pedagogy

³ Ibid., 121.

⁴ Ibid., 185.

⁵ Ibid., 134.

in the traditional in-person teaching.”⁶ Resonating with Bers’ belief in the contributions of coding activities to character-building among youths, the remainder of this review explores the potential of employing these insights in the context of higher education, especially in teaching academic integrity to college students. My colleagues, both faculty members and graduate instructors, and I have all focused our efforts on preventing students from partaking in academic misconduct. In my class, I underline the requirements on the syllabus, recommend Purdue University’s Online Writing Lab (OWL) and other online resources to them, and even request that students allow me to preview their drafts before the final submission. However, it is unavoidable that some students still apologize in the end for not carefully reading the requirements or overlooking the rules after learning their grades. While some instructors may blame misconduct on students’ recklessness and ruthlessly regard it as dishonesty, this response does not always solve the problem efficiently.

Growing up watching Tik-Toks instead of reading the *Ramona* series, Gen-Z students are prone to be visual and social instead of verbal learners. Bers’ research inspires me to consider devising an interactive platform. It aims at helping students learn how to take appropriate citations in coding activities. It provides automatic feedback after students “codify” their citations. Similar to Python’s IDE, it does not return the correct answer but instead shows the location of errors. Contrary to the dull document that may be titled something along the lines of “how to reference primary and secondary sources appropriately,” this coding-like practice may be a more efficient solution.

Overall, *Beyond Coding* is a well-written monograph that is advantaged by its well-designed research. For educators at different levels, ranging from K-12 school to college, teaching different subjects relevant to ethics, Bers’ research and reflections prove to be insightful and inspiring.

⁶ Shu Wan, “When Returning to Campus, I Realized I Miss Virtual Courses,” Hybrid Pedagogy (Hybrid Pedagogy, October 7, 2021), <https://hybridpedagogy.org/when-returning-to-campus/>.