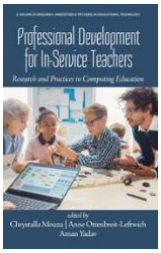
Teachers College Record
The Voice of Scholarship in Education

Professional Development for In-Service Teachers: Research and Practices in Computing Education

Reviewed by Michele Mosco



Professional Development for In-Service Teachers: Research and Practices in Computing Education

Editors: Chrystalla Mouza, Anne Ottenbreit-Leftwich and Aman Yadav
Publisher: Information Age
Pages: 426
Publication Year: 2022
ISBN: 9781648029073

The importance of computer science education in K-12 education is widely acknowledged, and nonprofits, corporations, and other agencies have developed initiatives to this end. However, higher education is not producing the number of graduates needed to teach K-12 computer science education as well as the integration of computer science into content area curricula. Professional development programs created to bridge this demand have largely consisted of standalone and short-term approaches. But what about longer term programs and support for teachers? Do these provide teachers with better self-efficacy and confidence to teach computer science? The purpose of this book is to examine some of the innovative professional development approaches and describe the lessons learned in their implementation.

Professional Development for In-Service Teachers: Research and Practices in Computing Education comprises 401 pages, divided into 16 chapters organized in four parts. This text is a follow up to the editors' *Preparing Pre-Service Teachers to Teach Computer Science: Models, Practices and Policies*. This volume is also part of the Research, Innovation & Methods in Educational Technology series edited by Chrystalla Mouza and Nancy C. Lavigne.

Part I, “Professional Development Approaches for Elementary and Middle School Content Area Teachers,” provides readers with specific professional development approaches to develop teachers’ computational thinking integrated practice in the elementary and middle schools.

In Chapter 1, “Computational Thinking in Elementary Classrooms: A Toolkit to Scaffold Teacher Learning,” Yadav, Rich, Schwarz, and Larimore describe the toolkit that was developed to support elementary school teachers integrate computational thinking into their classrooms. How the unplugged mathematics and science activities contained within the toolkit were implemented was discussed.

Chapter 2, “Teacher Co-Design in a CS for All Research-Practice Partnership: Curriculum Development and Teacher Learning” by Sullivan, Adrion, Tulungen, and Pektas, provides a look at the first year of a four-year research–practice partnership integrating computational thinking into a school district curriculum. Teachers worked in pairs to develop modules to integrate into elementary-level science lessons.

In Chapter 3, “Professional Development Supporting Middle School Teachers to Integrate Computational Thinking Into Their Science Classes,” Biddy, Chakarov, Jacobs, Penuel, Recker, and Sumner depict their professional development model in which middle school teachers co-design computational thinking integrated storylines and prepare to implement them with their students. This multi-year program alternates between placing teachers in the teacher and student roles.

In Chapter 4, “Teachers’ Knowledge and Skills in Computational Thinking and Their Enactment of a Computationally Rich Curriculum,” Lee, Hsiao, and Anderson describe a professional development model that integrates computational thinking modeling and simulation activities into middle school science classrooms. Through two case studies, the researchers present implications for immersing computational thinking and computer science into science classrooms.

Vincent, Lee, Rogowski, and Recker provide in Chapter 5, “Looming Code: A Model, Learning Activity, and Professional Development Approach for Computer Science Educators,” a description of Expansively framed Unplugged (EfU), their conceptual model for developing computer science activities. They also follow an elementary school librarian who attends professional development to learn EfU and then implement it with two classes.

Part II, “Professional Development Approaches for High School Teachers,” provides readers with glimpses of some of the types of professional development models that have been developed for high school computer science teachers.

In Chapter 6, “Re-Making Education in STEM Classrooms with Computational Making,” Gravel, Olivares, and Tucker-Raymond present their model of professional development that changes teachers’ thinking about disciplines, materials, and co-learning with students through computational making.

Chapter 7, “Culturally Responsive Methods for Engaging All Students in Computer Science Principles” by Che, Latimer, Kraemer, and Sitaraman, describes how a culturally responsive pedagogical perspective framed a week-long professional development experience for prospective computer science teachers as well as their subsequent school year. The teachers’

strongest implementation of culturally responsive pedagogy was their belief in student's academic potential.

In Chapter 8, "E-Books for High School Computer Science Teachers," Ericson and Guzdial describe the use of interactive e-books in professional development. The e-book's design focused on "examples + practice" because engagement was a major goal. The results indicated that the books were effective in this context.

Chapter 9, "Implementing a Professional Development Framework to Assist the Rollout of Computer Science in Second-Level Schools in Ireland" by McGarr, Goos, McInerney, Johnston, and Fleming, describes the professional development framework developed to support the rollout of computer science in secondary schools in Ireland. The authors also examine how communities of practice develop in light of social identity theory.

Part III, "Ongoing and Scaling Up Professional Development Approaches," does an excellent job of illustrating different manners to offer continued professional development in a scale model.

Chapter 10, "Supporting Ongoing Teacher Capacity and Development: Moving Beyond Orientation Professional Development to Support Advanced Teacher Learning" by DeLyser, Wortel-London, and Wright investigates professional development for teachers of computer science (CS) after the initial training workshops have been attended. They stress the need for ongoing training and support of teachers.

In Chapter 11, "Leveraging Collective Impact to Scale Computer Science Teacher Professional Development and Certification," Fletcher and Warner describe how WeTeach CS, a collective impact approach to scale up preparation for teaching high school computer science, relied on collaborative networks of partners.

In Chapter 12, "Expanding Computer Science Opportunities: A Personalizable, Flexible Model for Professional Learning," Frye, Samberg, and Nguyen present a successful model that addresses the learning needs of new CS teachers beyond an initial week of workshops. Their model is also differentiated from personalized learning in that there are no pre-set pathways for teachers to choose; instead, every element is based on teacher needs and preferences.

Chapter 13, "Code Savvy Educators: A Professional Development Model for In-Service Educators" by Peterson, Scharber, Barksdale, Vazquez, and Cozzolino, focuses on explaining the history, guiding framework, and professional development model of the MNCodes Educator Training Program. In this year-long, cohort-based program, 35 educators develop their skills through participation in activities. Recommendations and considerations for implementing computer science/computational thinking professional development are included.

Part IV, "Alternative Professional Development Approaches: University Courses and Micro-Credentials," includes graduate university coursework as well as micro-credentials that are both job-embedded and performance-based.

In Chapter 14, "Supporting In-Service Teachers in Understanding the Potential of Data and Artificial Intelligence to Influence and Impact Learning," Olmanson, Davis, and Kilbride describe the experiences of five graduate students who completed a course "meant to raise awareness about AI [artificial intelligence] in education" (p. 321). The researchers focus much of the chapter on the students' learning around a self-selected final design project.

Chapter 15, “Credentialing Computation” by Burke, Angevine, Proctor, Weisgrau, and O’Donnell, describes the use of competency-based education and micro-credentials as a means to develop educator knowledge of computational thinking. Examples of student-generated projects and K-8 teacher plans and reflections are included.

In Chapter 16, “From Clock-Based to Competency-Based: How Micro-Credentials Can Transform Professional Development,” Rasberry, Weber, and Wilson investigate the effects of implementing a micro-credential program to improve computational thinking education in math and science.

I believe that the text fulfilled its stated purpose and examined innovative professional development approaches for in-service teachers. The methods were divided appropriately by grade level. Each chapter provided some context for the intervention and went on to describe its implementation. Of course, limiting each of these projects to the size of a chapter does not provide some of the more ambitious projects enough space even to succinctly cover all aspects of their program. This left gaps in the program story that was being told and made it more difficult for the reader to visualize the entire program. However, the content in the chapter should be enough to pique the readers’ interest to learn more. Links to additional information, if available, about each of the specific programs described would have proven helpful.

Another welcome addition to the introduction of the text would have been an extended explanation of what computational thinking (CT) is. Mentions of CT in the introduction assumed readers already were familiar with the term, and even in Chapter 1, where the subject of the chapter was computational thinking, the authors delved right into problems with implementation of CT. A reader had to determine what CT was based on context clues that immediately began discussing the project at hand. A concise explanation and examples of CT would have assisted readers to fully understand the professional development innovations included in the book.

Another criticism of the text was minor. Several of the chapters in the book could have benefitted from additional proofreading.

Overall, I thought that *Professional Development for In-Service Teachers* accomplished its stated purpose. It offers snapshots of innovative professional development approaches to developing teachers’ self-efficacy and knowledge for teaching computational thinking and computer science. Lessons learned from each of the programs are also included. The book is an important addition to the literature.

Author Biography

Michele Mosco, EdD, is an instructor in Technical Writing and Communication in the College of Integrative Science and Arts at Arizona State University. She has been passionate about technology since earning her degree in computer programming in the early 1980s. “Influencing Young Women to Pursue Creative Information Technology Careers,” a chapter co-authored with Audrey Amrein-Beardsley, was published this year. “Plagiarism and Copyright: An Analysis of Technical Communication Textbooks” recently appeared in *Technical Communications Journal.* She has also reviewed book proposals for Oxford University Press, MIT Press, and Columbia University Press.