Advancing Opportunities for CS Teachers

How To Best Support Professional Development for Experienced Teachers in K-12 CS Education

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ABSTRACT

In K-12 education, nearly all efforts focused on expanding computer science education center on the induction of new computer science teachers, with very little attention given to support the ongoing needs of experienced computer science teachers. More seasoned teachers benefit from deepening their content knowledge, pedagogical practices, and knowledge and capacity to provide equitable and inclusive learning experiences that results in students feeling a sense of belonging in computer science. This panel will discuss (a) the needs of experienced CS teachers from a variety of perspectives, including teacher education researchers, professional development leaders, and high school practitioners and teacher facilitator, and (b) collectively outline a research and practice agenda that focuses on supporting, retaining, and further developing experienced teachers through expanded professional development, leadership opportunities, and community for CS teachers.

CCS CONCEPTS

• **Social and professional topics** → **K-12 education**.

KEYWORDS

Teacher Education; Professional Development; Computational Thinking

1 SUMMARY

As computer science in K-12 education is expanding rapidly [1–3], this expansion has experienced an urgent pressure to develop new CS teachers, largely through introductory, content-driven professional development. Yet at the same time, these efforts—combined with a sizable group of teachers with much lengthier experience in CS—is quickly developing into a cohort of experienced CS teachers with needs for their own growth and engagement for retention [4]. Expertise required to teach CS may be changing as well: reaching out to the wide range of participating students now joining courses. In this panel, we will focus on the particular needs of experienced CS teachers in order to support their own learning and persistence including learning content, developing pedagogy, deepening equity, and connecting with a broader CS community. In this panel, we bring together experts from teacher learning (Goode), CS professional development (Yadav, Fields), CS professional teacher organization (Twarek, Logan), high school CS teaching (Logan, Twarek) and CS education research (Fields, Goode, Kafai, Yadav). We will start the panel (virtual or not) with an overview of the challenges facing CS teacher development followed by short remarks from each panelist (5 min each), and discussion with prompts from the moderator and the audience.

2 JOANNA GOODE

In recent years, there has been increased attention to identifying and supporting teachers to begin teaching computing courses in their classrooms. Yet, while necessary, these one-time professional learning workshops are insufficient in supporting the ongoing, professional needs of more experienced computing teachers. Recent efforts illuminate how more advanced professional development opportunities, focused on specialized and emerging computing topics, such as electronic textiles, can provide rich, authentic professional learning experiences that are rooted in inclusive practices and pedagogies. Importantly, more advanced professional learning experiences are likely to improve the retention of computer science teachers through professional growth and opportunities to take on leadership positions such facilitating professional development or serving as an instructional coach.

Joanna Goode is the Sommerville Knight Professor of Education at the University of Oregon and a former high school computer science teacher. Her research examines how school structures and educational

practices can support equitable and inclusive computer science teaching and learning. She co-developed the Exploring Computer Science course and co-authored Stuck in the Shallow End: Education, Race, and Computing (2008/2017).

3 LINNEA LOGAN

As the only CS teacher in my school, I will speak to the power of the community of CS teachers to support new and experienced teachers not only as we begin teaching CS, but as we continue to teach, make curricular decisions, and develop and shape our programs. Active involvement in the CS teaching community helped inspire and invigorate me and helped me examine how I teach CS and learn how to develop a program to better serve all students.

Linnea is a secondary Computer Science teacher with 25 years of teaching experience. She has worked the past 7 years redeveloping a computer science program focused on equity, inquiry and access for all students. She teaches Exploring Computer Science, AP Computer Science Principles and AP Computer Science A. Linnea facilitates Exploring Computer Science professional development and serves as an AP reader. As co-president of WI CSTA she strives to develop a vibrant support network for WI CS teachers. She is working with national partners to develop engaging online PD and mentoring opportunities for CS teachers.

4 BRYAN TWAREK

While today's CS educators enter the field from many different routes, with different areas of specialization, and preparation, two aspects are critical: teaching experience and CS content experience and that even experienced teachers need differentiated, ongoing professional learning to develop in their areas of need and to keep pace with the quickly evolving discipline. I will discuss how CSTA's development together with ISTE of Standards for CS Educators can articulate a vision for high-quality teaching of K-12 computer science and provide a road map for teachers of all experience levels to identify strengths and weaknesses and seek out professional development opportunities to increase their mastery.

Bryan Twarek is the Director of Education of the Computer Science Teachers Association (CSTA), where he develops programs to improve the teaching and learning of K-12 computer science. He was a middle school teacher, before becoming a site and then school district administrator. As Supervisor of Computer Science for the San Francisco Unified School District, he created and implemented an equity-minded policy for compulsory PK-12 CS education.

5 DEBORAH FIELDS

We should attend to interest, agency, and creativity in CS education with teachers as well, considering their individual interests, valuing their agency as experienced professionals, acknowledging their funds of knowledge from across their teaching and personal experiences, and building on their local knowledge and roles as adaptors and implementors of educational content. I will share insights about experienced CS teachers' participation in professional development workshops that uses an arts and constructionist approaches to advance their learning of new CS content and pedagogical approaches.

Deborah Fields is an Associate Research Professor at Utah State University, where she investigates student learning through making creative computational artifacts and studying relationships between design, personal relevance, and learning. She co-developed the e-textiles unit for Exploring Computer Science and has led numerous professional development workshops and courses for teachers internationally.

6 AMAN YADAV

Given the unique challenges computer science teachers face such as isolation and lack of quality professional learning materials, the question remains: How do we develop CS teachers' knowledge to teach computer science (i.e., pedagogical content knowledge) and measure that knowledge? I will discuss results from our work on designing professional development (PD) for CS teachers and how their background influences their experiences during the PD. In addition, I will also share how to measure teachers' computer science pedagogical knowledge.

Aman Yadav is a Professor in Educational Psychology and Educational Technology Program at Michigan State University. His research focuses on improving student outcomes in computer science and engineering at the K-16 level by preparing pre-service and in-service teachers to teach computing ideas and implementing active learning approaches to improve student outcomes in undergraduate computer science and engineering.

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