Investigating the Impact of Computer Science Professional Development on Teacher Practice: A Multiple-Case Study Analysis

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Objectives

This study examines how teachers employ learning from a computer science (CS) professional development (PD) program back in their classrooms, and how undergraduate CS students support partner teachers in integrating CS into their lessons.

Background

Initiatives such as CS for All underscore the gravity of providing all students an opportunity to develop the knowledge and skills associated with CS. However, realizing the goals of such programs is problematic because two-thirds of secondary school CS teachers have no degree or background in CS (Century et al., 2013). Moreover, few elementary and middle school teachers have the necessary knowledge or skills needed to integrate CS into their curricula (Barr & Stevenson, 2011). Given the current status of CS education and teacher preparation, providing in-service teachers with PD in CS content, skills and pedagogy is crucial, but the design and implementation of such PD is relatively new.

Methods and Data Sources

We developed a two tiered approach to CS PD comprised of a week-long CS Summer Institute targeting CS content, skills and pedagogy, and follow-up support from university undergraduates with a CS background. This study is a compilation of multiple case studies in which we examined how three teachers who took part in the PD applied what they had learned and what support they obtained from their undergraduate partners. Data consisted of classroom observations, teacher interviews and weekly undergraduate partner reflections. Data were read and analyzed using an emergent coding scheme (Given, 2008). Themes emerged in four main categories: (a) Computational Tool Use, (b) Pedagogical Approach, (c) CS Skill/Principles Taught, and (d) Undergraduate Role.

Results

The data suggest that teachers' use of computational tools was influenced by what they had learned during the PD and by what they had access to within their work environments. Despite limitations on access to tools, undergraduate partnerships offered increased access to a wider variety of tools. Additionally, teachers' pedagogical approach to CS delivery was influenced by both the PD and the resources they used. Teachers often used direct-instruction or challenge-type approaches based on materials available online, which were designed to complement the computational tools they were using. Furthermore, much of the classroom instruction revolved around Programming, while other CS ideas (e.g., data, impacts) were often overshadowed. Finally, the undergraduate partners facilitated class work by teaching students, facilitating the design of classroom activities, and supporting teachers in their use of CS tools and learning of CS concepts.

Scholarly Significance

The body of work examining CS PD is limited (Menekse, 2015), To our knowledge, no previous study has examined teachers' pedagogical approaches to CS delivery or the use of CS undergraduate partners as ongoing support. This study demonstrates that teachers are able to implement CS tools, ideas and practices learned during a summer PD. Furthermore, providing teachers with undergraduate partners supports teachers in their implementation of tools, ideas and practices, offering evidence that this two tiered approach offers a viable template for CS PD.