

Delivering Virtual K-8 Computing Professional Development in Rural KY

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Abstract— Teachers living and working in rural areas in the United States often lack access to high-quality professional development (PD) opportunities. As computer science (CS) and computational thinking (CT) education pathways increasingly develop in rural districts, it is essential to provide quality PD for their teachers so they can identify opportunities for and plan to embed CS and CT learning in their classrooms. A key element in delivering high-quality PD is understanding the specific educational and wider cultural needs of the community where it will be delivered, something we call “mining cultural capital”. In this poster, we report on the delivery of four 30-minute virtual PD sessions within two rural school districts in Eastern Kentucky: Pikeville Independent and Floyd County Schools. The virtual sessions were specifically geared toward elementary and middle school teachers. The sessions were led by a long-time educator in the region who worked to curate relevant examples and delivered the PD via a recorded video conference. The recordings are available for teachers in the region to watch and re-watch as they develop their lessons. Survey results showed that participating teachers found the PD to be valuable. Furthermore, feedback from teachers suggests that access to these short just-in-time PD sessions provided valuable learning opportunities and also sparked new lesson ideas for teachers.

Keywords—rural education, computing pathways, equitable access to computer science education, computational thinking, professional development, broadening participation in computing

I. INTRODUCTION

Fewer than two-thirds of K-12 schools offer any computing-based curricula, and students in rural communities are less likely to attend schools that offer CS courses due to the lack of teachers and resources at those schools [1][2]. This leaves a tremendous national shortage in capacity for, access to, participation in, and experience of computing education in rural schools.

To increase quality offerings in CS/CT, Pikeville Independent School District and Floyd County Schools in rural Eastern Kentucky partnered with Digital Promise (DP), South Fayette School District (SFSD), and Bit Source, a local software development company invested in economic

redevelopment. The ensuing research practice partnership (RPP), Tough As Nails, Nimble Fingers (TAN), is committed to developing high-quality computing curricula for all students. The goal of the TAN project is to develop consistent and cumulative K-8 computing pathways that broaden participation in computing throughout the wider Eastern Kentucky community. Based upon a 2019 National Science Foundation Computer Science for All (CSforAll) grant, this work represents a modest step to address the steep computing teacher shortage in rural Eastern Kentucky, an area of the country economically and socially devastated by the mass departure of the coal industry [3] [4]. Central to the TAN project is the design and implementation of professional development opportunities for teachers to become more comfortable integrating CT practices.

II. CT BOOSTERS: OBJECTIVES AND DESIGN CONSIDERATIONS

As it became clear that the 2020-21 school year would continue in a hybrid format, the TAN RPP examined the ecosystem of these rural Kentucky communities to better understand the opportunities and challenges of delivering professional development during the continuation of a hybrid teaching and learning model. Additionally, as a result of the COVID-19 pandemic, the RPP was faced with new challenges—most notably, effectively offering professional development opportunities remotely. As the project considered how to best support K-8 teachers amidst the uncertainty of the pandemic, the RPP team was not able to find robust, integrative, and teacher-facing PD offerings in a substantial digital format. Accordingly, the team decided to collaboratively design our own solution specific to the two district and the Eastern Kentucky environment.

The team designed four 30-minute on-demand instructional workshops tailored to the existing needs of the Floyd and Pikeville teachers, featuring grade-level and subject area specific CT lesson ideas including plugged, unplugged, and virtual-friendly options. The four CT Booster sessions were: K-2: Data & Analysis: November 10, 2020; 3-8: Data & Analysis: November 17, 2020; K-2: Algorithms: January 12, 2021; and 3-8: Algorithms: January 19, 2021. Slides for all sessions can be found here: <http://bit.ly/CTBoosters>

In the model of the direct, hands-on, and district-facing specificity of “just-in-time” digital technology PD [5], the team opted for our CT Boosters model as a practical “middle ground”, practically situated between the extensive time commitment required of day-long workshops and the brevity of simply sharing videos and websites. The workshops were called CT Boosters since they were designed to complement a previous week-long 2020 Summer Institute training session [6] much like a “booster shot” is an extra dosage intended to support health. This PD offering provided a novel solution to not being able to do in-person PD. The short, synchronous “booster” format allowed us to be mindful of teachers’ stress-level and schedules.

A. Designing to Maximize Relevance

The CT Booster session were generated from the notion that the project needs to center and celebrate the existing pool of high-quality lessons in Eastern Kentucky while also helping teachers identify opportunities to integrate CT into this lessons. By design, the lessons presented in the sessions mined cultural capital in the region while intentionally sharing CT lessons that teachers could see themselves teaching. The project is not about offering a series of “canned” stand-alone coding activities, but rather about introducing high-quality lesson ideas for integration into different subject areas, including K-8 math, English/ language arts, and science. Examples of how the team did this will be shared in this poster presentation.

When teachers have the opportunity to implement CT practices into lessons they already teach, it demystifies CT for the instructor and students alike [7]. Considering this element of cultural relevance, the team knew it was important that the PD sessions be designed and presented by someone who understood the culture and community of Eastern

Kentucky. The project’s site director, Traci Tackett was able to gently introduce important CT practices and vocabulary while aligning the examples to state standards. Example lessons were carefully selected and were conveyed in ways that encouraged participation while conveying expectations of CT understanding in ways that teachers can understand (e.g., recipes aren’t an algorithm if they don’t specify the order in which tasks need to be accomplished). In addition, Ms. Tackett shared authority and power with the audience, and suggested they do so with their students (e.g., sharing her own misconceptions about algorithms; encouraging teachers to learn alongside students).

III. LESSONS LEARNED

Post-workshop surveys were administered at the end of each Booster session via a Qualtrics link. Results from the survey showed that teachers found the sessions valuable in helping them see how they might incorporate CT into their classes. One teacher said: “I learned some apps that I can use in my classroom, such as Scratch Jr.” And another said: “It showed that algorithms are easy to adapt or add into any curriculum.” Teachers also pointed out that the KY Boosters helped them understand “the vocabulary that I need to use with students.” The KY Booster sample lessons also sparked new lesson ideas for some teachers including one teacher who got the idea to have students create an algorithm dance to do during designated “brain breaks.”

The TAN team is now more closely considering the pedagogical implications of offering teacher PD exclusively online and what the ramifications will be for Pikeville and Floyd County children as schools begin to welcome students back face-to-face. *What is the role of project-based learning among schools that will increasingly be expected to “make up for lost time” and remediate their students’ learning in the priority subjects such as math and ELA? What is the role of CS and CT in helping to support such learning? Can computing help ground math and ELA content in collaborative and real-world activities?* These are three new questions the Tough as Nails Team are asking and discussing together.

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