Supporting Teacher Understanding of Emergent Computational Thinking (CT) in Early Elementary Students

EDC Education Development Center

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In partnership with *Participate*, a social learning platform

Project Goals

The project engages researchers, professional development providers, and early elementary teachers (K–2) in a collaborative research and development process to design a scalable professional development (PD) experience for K–2 teachers. From both practice and research perspectives, we have found that elementary grade teachers who have had initial PD and coaching in CT typically recognize the potential relevance of the topic for their students, but do not feel that they know how to identify or interpret the development of emergent CT in their students' talk or work in ways that allow them to adapt their instruction appropriately. We are seeking to identify the artifacts, facilitation strategies, and modes of interaction that effectively prepare K–2 teachers to learn about their students' emergent use of computational thinking strategies. The teachers' learning is supported through instructional coaching, both face-to-face and through an online community of practice.

Project Design

Phase 1: Work with six K–2 teachers (Cohort 1) who already integrate CT into their instruction to codesign, pilot, and iterate on strategies for attending to, interpreting, and responding to students' emergent use of CT practices.
Phase 2: Run a CT Boot Camp for 25 K–2 teachers (Cohort 2) introducing CT concepts and practices using the community of practice platform, *Participate.*
Phase 3: Provide continued support to Cohort 2 during the development and implementation of CT integrated unplugged and plugged lessons.

Research Questions (RQs)

We are using interviews, surveys, observations, and documentation from the online platform to understand teachers' professional learning and development.
Research Questions:

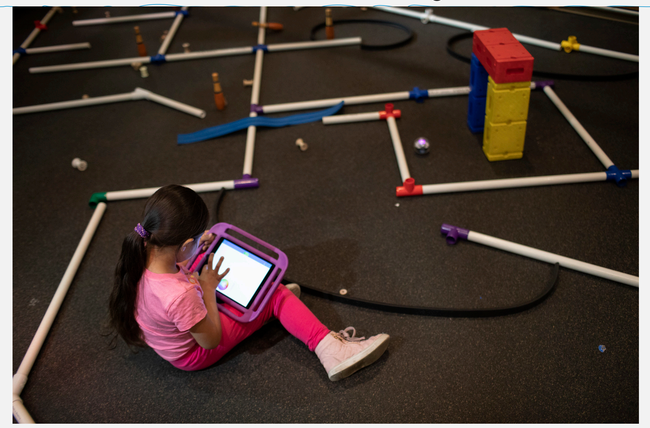
1. What kind of PD and guidance do teachers need to identify and support emergent computational thinking development in young students' language and work process?
2. What kind of PD and guidance do teachers need to identify emergent computational thinking development in young students' work products?
3. How can a scalable professional learning system help teachers understand the development of emergent computational thinking in K–2 students?

Preliminary Findings

RQ1: Teachers in both cohorts benefitted from PD and guidance materials that focused on teaching students **the process of using CT** and that had less emphasis on teaching CT vocabulary.

RQ2: PD that helped teachers in both cohorts identify emergent computational thinking development in students' work products included **informal, formative assessment** strategies, including
-observing student work,
-listening to peer discussions, and
-listening for descriptions of concepts/process during share out.
Teachers also identified **drawing on pedagogical content knowledge and prior experiences** when deciding which types of strategies were best to use for individual students and specific lessons.

RQ3: Teachers in both cohorts used the professional learning platform in order to
-refresh their memory of CT concepts in advance of lesson preparation,
-refer to other teacher's lesson plans for ideas on integration| strategies,
-share their ideas with colleagues for feedback, and
-maintain contact and share ideas with colleagues from other schools.



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How Teachers are Describing Evidence of Students' Use of CT in Their Classwork

Pattern Recognition

Teachers ask students to **describe their design choices and explain their steps for solving problems**.

"I started my lesson by giving the problem to the students, explaining that there's not one particular way to solve a problem. It's how you're able to explain it. … And then I explained that in a problem, there might be patterns and then I talked a little bit about what patterns are." — Teacher

Abstraction

Teachers ask students **to identify information that is unnecessary** and to **focus on what is important to help solve the problem**.

"[Student] said, "We don't need to know the name of the people in the story, because all we want to know is the answer." And then I'll ask her, "Why?" She'll say, "That has nothing to do with what we want to complete." So, start thinking more like, what is it that we want to solve? What is the problem? So, they're focusing more on the problem rather than any extras that the problem might entail." — Teacher

Decomposition

Teachers focus on **observing students breaking down larger or complex problems** while completing classwork.

"They didn't really say decomposition or anything like that, just specifically saying, "Oh, I can break down the problem."… At the end, I was able to see they were using some CT strategies like decomposition." — Teacher

Debugging

Teachers **listen to peer discussions during collaborative work to hear examples of students identifying mistakes** and finding solutions to fix them.

"The debugging kind of threw them off a little bit, I think just the terminology. Once they understood what it was, they were able to be, like, "Oh, we're just fixing something." — Teacher

PROJECT TIMELINE

PHASE 1
Spring 2022
Codesign and pilot lessons with Cohort 1

PHASE 2
Summer 2022
CT Boot Camp for Cohort 2

PHASE 3
Winter 2023
Unplugged lesson implementation Cohort 2

PHASE 3
Spring 2023
Plugged lesson implementation Cohort 2