

FROM TERRIFIED TO COMFORTABLE: A FOURTH-GRADE TEACHER'S JOURNEY IN TEACHING CODING

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Collective Argumentation Learning and Coding (CALC) is a project focused on providing teachers with strategies to engage students in collective argumentation in mathematics, science, and coding. Collective argumentation can be characterized by any instance where multiple people (teachers and students) work together to establish a claim and provide evidence to support it (Conner et al., 2014b). Collective argumentation is an effective approach for promoting critical and higher order thinking and supporting students' ability to articulate and justify claims (Nussbaum, 2008). The goal of the CALC project is to help elementary school teachers extend the use of collective argumentation from teaching mathematics and science to teaching coding. Doing so increases the probability that teachers will integrate coding in regular classroom instruction, making it accessible to all students.

A total of 32 elementary school teachers participated in the CALC project, which included a semester long course focused on coding content and strategies to implement collective argumentation in the classroom. Teachers were interviewed before and after the course. Ten teachers were selected to participate in the enactment phase, in which classroom observations and stimulated recall interviews were conducted. All class meetings, observations, and interviews were audio- and video-recorded. Data were analyzed using previously established analysis methods for beliefs and argumentation (Conner et al., 2014a; Conner et al., 2011; Kim et al., 2013). We highlight Gloria (pseudonym), a fourth-grade teacher from Cohort 1 because of the extent to which she went from fear of coding to fluent implementation.

Initially Gloria was comfortable engaging her students in argumentation, explaining they already used it in mathematics with Cognitively Guided Instruction (CGI). However, she was "terrified" (Int 2) about learning to code because she didn't view herself as proficient with technology. She was willing to overcome her fear of coding because she saw the value in providing her students with coding experiences that would help them develop necessary skills for our increasingly technological society. Gloria saw coding fitting naturally into mathematics, but she asked for ideas on how to integrate coding into other subjects: "Yeah, I can do shapes. What else can I do that's beyond that? What's something I can push the limit on?" (Int 2).

In our first observation, Gloria requested not to wear a microphone and asked members of the CALC project to co-teach with her. In this lesson, her students engaged in argumentation while coding prebuilt robots to travel around a rectangle with a specified perimeter. In our final observation, Gloria successfully implemented a lesson that included students programming more complex robots to travel a map of the Oregon Trail. Reflecting on this lesson, Gloria was "proud" that her support moves had become less leading, allowing for more student discovery and argumentation (Post-obs Int 2). In the course of three months, Gloria's instruction progressed from using simple coding activities to more sophisticated coding platforms. This progression in her coding instruction paralleled the change in her personal feelings about coding as she moved from "terrified" to "comfortable with it" (Post-obs Int 2).

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