Computational Thinking-Integrated Elementary Science with Culturally Responsive Teaching: A Vignette Study

Yue Xin
College of Education
University of Maryland
College Park, MD
yxin21@umd.edu

Kristina Kramarczuk
College of Education
University of Maryland
College Park, MD
kkramarc@umd.edu

Janice Mak
College of Education
Arizona State University
Tempe, AZ
Janice.mak@asu.edu

Ebony Terrell Shockley
College of Education
University of Maryland
College Park, MD
eterrel@umd.edu

Diane Jass Ketelhut
College of Education
University of Maryland
College Park, MD
djk@umd.edu

ABSTRACT

In response to the persistent diversity gap that exists in the computing field, we implemented a five-day professional development (PD) workshop for elementary teachers on integrating computational thinking (CT) and culturally responsive teaching (CRT) practices into their existing science instruction. An explicit focus of this PD was to engage teachers in analyzing CT- and CRT-integrated science classroom scenarios (i.e., vignettes). Our analyses of video and written data of teachers' vignette responses indicate that while their understanding of CT increased as a result of the PD, the teachers need additional support around CRT. We suggest that future studies explore how teachers define and enact CRT, especially within their unique contexts.

1 BACKGROUND & IMPLICATIONS

One way to target current disparities in CS education is to support K-12 educators in centering and affirming student identities through culturally responsive teaching (CRT)[1]. In this study, we investigate the impact of a five-day professional development (PD) workshop on integrating computational thinking (CT) and CRT into elementary science lessons. Our PD focused on CT because CT leverages the foundational skills associated with CS (e.g., abstraction, algorithmic thinking) while lowering the threshold for computing in schools [2].

Across four days, 24 elementary teachers in the Southwest US reflected on the level of CT and CRT integration in four written vignette examples. Vignettes provide a lens into how teachers understand and think about CT and CRT [2]. The vignettes were designed by the research team with reference to research-based definitions of CRT and CT. Teachers' written and verbal responses were inductively coded for analysis.

Finding 1: *Teacher reflections on CT evolved across the PD.* On Day 1, teacher examples of CT were vague (e.g., "Students were able to observe."). Responses from Day 4 contained substantially more detail (e.g., "The students examined a **systems** process (food web) and used a **simulation** (Scratch) to assess understanding.").

Finding 2: *Teacher understanding of CRT remained relatively constant across the PD, ranging from broad misconceptions of equity to specific, identity-driven definitions.* Over half of the teachers defined CRT as simply "hands-on" student-centered content or students "talking with their elbow partner." Whereas one teacher recommended that the instructor in a vignette provide more instructional supports for neurodiverse learners because she herself teaches special education.

Our findings show that teachers require focused, targeted, and sustained PD around CRT. Future work needs to consider how teachers define equity, which in turn becomes the lens through which they define and enact CRT.

ACKNOWLEDGMENTS

This material is based upon work supported by the National Science Foundation under Grant No. 2101039 and 2101526.

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SIGCSE 2023, March 15–18, 2023, Toronto, ON, Canada

ACM ISBN 978-1-4503-9433-8/23/03.
https://doi.org/10.1145/3545947.3576255