Chapter 18
Computational Thinking and Making in Virtual Elementary Classrooms

Robin Jocius
University of Texas at Arlington, USA

Melanie Blanton
The Citadel, USA

Jennifer Albert
The Citadel, USA

Deepti Joshi
The Citadel, USA

Ashley Ray Andrews
The Citadel, USA

ABSTRACT

This chapter documents findings from the Making CT (Computational Thinking) project, a collaborative effort between project team members and elementary teachers that aims to reimagine interdisciplinary, computational thinking-infused making lessons for a virtual format. Virtual making CT lessons were grounded in four design principles: standards-based practices, clear and explicit expectations, multiple means of engagement, and opportunities for collaboration. Drawing on data from virtual teacher professional development sessions, lesson implementation, and teacher interviews, this chapter illustrates how teachers were able to engage in the difficult work of reconceptualizing CT-infused making lessons for the virtual classroom. These principles can be used to support the design of other interdisciplinary activities to support P-5 students' development of creative and authentic problem-solving in virtual learning environments.

INTRODUCTION

One student stuffs a rainbow mixture of green, pink, and yellow kinetic sand into a bucket, as another carefully charts the sequence of steps using both pictures and words. All across the room, students are sequencing steps, designing algorithms, and debugging to build their sandcastles.

This scene happened in Aimee's fourth-grade classroom in February 2020, just before the COVID-19 pandemic shifted classrooms all over the world into virtual or hybrid spaces. As teachers quickly learned to navigate new technological tools and online learning platforms, they faced immediate and pressing challenges, including experimenting with new pedagogical approaches, meeting students' social and emotional needs, and supporting parents as they took on new roles as learning partners. As the pandemic progressed and many teachers became accustomed to different teaching modalities, new questions emerged: How can teachers leverage the affordances of virtual learning environments to support student collaboration and critical thinking? Is it even possible to foster a sense of play, wonder, and creation while teaching online?

This chapter describes the Making CT (computational thinking) project, a collaborative effort between project team members and elementary teachers that aims to reimagine interdisciplinary, computational thinking-infused Making lessons for a virtual format. In Spring 2020, members of the project team began working with eight K-5 teachers to integrate Making and CT into classroom instruction. The goals for Making CT were to develop a professional learning community to use CT to support content learning in core disciplines such as math, English language arts (ELA), social studies, and science, and partner with teachers to develop CT-infused Making lessons for classroom use. As the pandemic required teachers and students to move into virtual spaces, the focus of the project likewise shifted to developing online teacher communities and designing interactive lessons for virtual settings.

This chapter first offers background on Making CT, which is grounded in research related to Making (Halverson & Sheridan, 2014), computational thinking, and teacher learning. It then details principles for designing interdisciplinary, virtual lessons and outlines the collaborative design process for three interdisciplinary, CT-infused Making lessons: *How to Code a Sandcastle*, *How to Code a Roller Coaster*, and *How Does Earth's Garden Grow?* Drawing on data from virtual lesson implementation, teacher interviews, and virtual professional development (PD) sessions, this chapter illustrates how teachers were able to engage in the difficult work of reconceptualizing CT-infused Making lessons for the virtual classroom. The conclusion offers suggestions for teacher development and support for bringing interdisciplinary, CT-infused Making into virtual and hybrid classroom spaces.

BACKGROUND

Although there is limited research on virtual learning in P-12 settings (Schwirzke et al., 2018), the COVID-19 pandemic has offered new opportunities for investigating virtual teaching and learning practices in authentic classroom contexts (Ferdig et al., 2020). A major concern for many educators during the pandemic has been finding ways to support critical thinking, creativity, and reasoning in virtual and hybrid spaces. In order to explore how teachers and students can engage in critical, creative, and collaborative practices in virtual and hybrid spaces, Making CT draws on research on Making in P-5 classrooms (Wohlwend et al., 2017), computational thinking integration into elementary classrooms and curricula (Bocconi et al., 2016), and best practices for supporting teacher learning (Trust & Whalen, 2020).

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