

Chapter 10

Transforming Lesson Design through Animation: Preservice Mathematics Teachers' Plan-Imations

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ABSTRACT

This chapter reports on a project in which elementary mathematics preservice teachers visualized lessons through an online animation platform. Preservice teachers at two universities engaged in an extensive project that translated printed mathematics curricular materials into visualizations of enactment. The project centered on preservice teacher-created animations as a way to extend the lesson planning process and more closely approximate actual decisions of teaching practice, including representations used, student contributions, and mathematical understanding. Project components are described with an emphasis on the role of animations as an extension of lesson planning. The intent is to understand the ways in which the technology platform illuminated preservice teachers' curricular decision making as they transitioned from a written lesson plan to animated lessons. Consideration is made for how the technology may provide transformational opportunities that otherwise may not have occurred.

INTRODUCTION

In the K-12 mathematics classroom, students construct knowledge through inquiry and hands-on experiences with mathematical models and notations. Teachers first gain experience in designing and orchestrating such learning environments in the context of mathematics methods coursework in licensure programs. In turn, mathematics teacher educators (MTEs) face the challenge of supporting preservice teachers' (PSTs) knowledge of content and pedagogical content, and how mathematics lesson plans may

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translate into inquiry-oriented, hands-on experiences for their students. Lesson planning is a key part of this learning process as PSTs learn to combine mental and written plans for action and consider what will occur during a lesson, which relates to student learning outcomes (McCutcheon, 1980). Yet preservice teachers typically take just one semester of mathematics methods coursework and, as such, have limited experience in grade and cultural contexts. Logistical and temporal challenges, such as inadequate access to classrooms or the short duration of licensure programs, constrain opportunities for PSTs to learn. Even when videos highlighting classroom practices are included in mathematics methods courses, there is a need to further extend PSTs' opportunities to learn, and to make them active agents in their learning. In this chapter, we consider the role of technology—specifically, an online animation platform—in the design of a learning environment for preservice elementary mathematics teachers allowing them to consider the orchestration of pedagogy and content in an elementary mathematics classroom.

The purpose of this research was to understand PSTs' vision for, or concept of, enacting a lesson plan in a simulated elementary classroom. We accomplished our goal through the flexibility and structure of an online platform in which PSTs brought a lesson plan to life through animation, a process we call 'Lesson Plan-imation'. Research shows that PSTs benefit from experiences that closely approximate practice (Grossman, Hammerness, & McDonald, 2009); however, many assignments in mathematics methods courses, such as writing detailed scripted lesson plans, lack the authenticity of an elementary classroom. Because we see methods courses in licensure programs as setting a conceptual and practical foundation on which PSTs continue to build throughout their careers, we were concerned with the design of a learning environment that would, on the one hand, support PSTs' visualized enactment of a lesson plan, and, on the other hand, afford opportunities for collective reflection on translating curricular materials and lesson plans into an actual classroom lesson (see Males, Earnest, Dietiker, & Amador, 2015, for reflection on this translation process). The animation provides an opportunity that could not otherwise be accomplished—deeming it a transformational technology innovation (Hughes, Thomas, & Scharber, 2006). We were interested in studying the relationship between what PSTs write on a written lesson plan and how they visualize—in this case, through animation—the lesson's enactment, in order to illuminate consistencies and inconsistencies between the two artifacts as well as the unwritten details that bring a lesson to life (i.e. instructional groupings, use of board space, anticipated student contributions, and discourse to engage all learners). Further, we were interested in understanding how technology relates to the written lesson plan: specifically, would the animation component a) replace, meaning take the place of or neither add or detract from the opportunities that exist without the technology; b) amplify, meaning enhance effectiveness; c) transform, meaning provide an experience otherwise not possible; or d) hinder, meaning negatively affect educational process or reduce efficiencies (Amador, Kimmons, Miller, DeJardines, & Hall, 2015; Hughes et al., 2006). As a result, the two guiding research questions for this study were:

1. How do preservice teachers describe changes they made between lesson plans and visualizations of those plans through animations? What is their rationale for these changes?
2. Does the technology replace, amplify, transform, or hinder the lesson planning process?

In this chapter, we consider the role of technology in elementary mathematics methods courses as a mechanism for learning. We first elaborate on both the context and goals of an elementary mathematics

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