

Mathematical Modeling Experiences in Nonformal Learning Environments for Preservice K-8 Teachers

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Because of the many purposes mathematical modeling serves, several organizations have called for the incorporation of modeling in K-8 mathematics education (AMTE, 2017; CCSSM, 2010; GAIMME 2nd edn., 2019; NCTM, 2000). Engaging in modeling as learners can help teachers more effectively implement modeling experiences in their own classrooms (Anhalt & Cortez, 2016; Burroughs, 2021; Wickstrom & Jung, 2024). This project seeks to explore the following questions:

1. How is mathematics used by a business owner in her work and how can her experiences be used to create tasks that make connections between elementary school mathematics and activities outside of school explicit for preservice K-8 teachers (PSTs)?
2. What are preservice PSTs' perceptions of the nature and purposes of mathematics?
3. How does an off-campus mathematical modeling experience in a nonformal learning environment impact PSTs' perceptions of mathematics?

Literature Review

Out-of-class environments can provide authentic contexts for students to engage in mathematical modeling (Boaler, 1993; Eshach, 2007; Martínez-Jiménez et al., 2022; Vale et al., 2019). Non-formal learning, which is usually structured, mediated with formal education, and teacher-led, has the potential to impact the affective domain of student engagement (Eshach, 2007), through positive, long-lasting memories of the experience (Falk, 1983).

Methodology

During Fall 2025, a business owner was interviewed regarding her use of mathematics in her work running a farm. This interview informed the design of out-of-school mathematics experiences for a math content course for PSTs. Students visited a farm to bake bread, estimate areas of fields, and engage in various profit estimation activities. Students engaged in tasks that required the application of arithmetic, proportions, percentages, fractions, estimation, and area. Interviews with students were collected focusing on their perceptions of the nature and contexts of mathematics.

Results

Data were analyzed using reflexive thematic analysis (Braun & Clarke, 2006) to identify themes regarding (a) connections between school mathematics and activities outside of school and (b) PSTs' perceptions of mathematics and its contexts and the purposes of learning mathematics. Themes identified from the businesswoman's interview include using elementary mathematics for profit estimation (including cost estimation and pricing goods), recipe development, and plant management (including diluting chemicals and estimating seed purchases). Results from this interview were used to create mathematical tasks for students during the field trip to the farm. Analysis of student interview data is still in progress at the time of writing. The results from this project will inform activity revisions and research design in future semesters.

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