Preparing to Teach Mathematics with Technology: Examining Student Practices (PTMT-ESP)

Project Overview

The Preparing to Teach Mathematics with Technology (PTMT) began with a grant awarded in 2005 to develop materials and support faculty in preparing future teachers to teach mathematics with technology. The first grant allowed for the development of materials for learning to teach Data Analysis and Probability with technology and to begin to build a community of Technology Using Mathematics Teacher Educators (TUMTEs). Subsequent grants allowed for the development of materials for Geometry and Algebra, further expansion and development of the TUMTE community, and an online portal making all of this work available for free. The current grant is utilizing design based research to create, refine, and study video-enhanced materials for prospective secondary mathematics teachers (PSMTs) to examine secondary students’ authentic mathematical practices on technology-based algebraic tasks.

Project Goals

- Design and refine seven curriculum modules
- Conduct research to examine PSMTs' development related to understandings of students’ technology-based algebraic practices and their own algebraic knowledge
- Expand and support the TUMTE community

Module Development

Module Topics:
- Sequences and Series
- Algebraic Equivalence
- Qualitative analysis of representations of functional relationships
- Comparing and Contrasting Linear, Quadratic, and Exponential Rate of Change
- The Function Concept - Functions and Non-Functions
- Characteristics of Function Families
- Connecting Trigonometric Operations and Trigonometric Functions

Faculty Development

The Reach

778 users in the PTMT Portal
University faculty, preservice teachers (university students), and district math supervisors and teachers

The Impact

6000+ teachers: Preservice teachers in university settings, practicing teachers in professional development, and online engagement through Portal and MOOCs

The Future

- Professional Learning Seminars for new faculty and current TUMTEs during years 4 and 5 of the project.

An Approach for Preparing Teachers to Teach Mathematics with Technology

To integrally develop prospective teachers’ understandings of technology, pedagogy, and content by having prospective teachers:

- Engage in mathematics tasks using technology
- Reflect on their own work with the technology as a learner of mathematics
- Consider the pedagogical implications of their own experience as it relates to the teaching and learning of mathematics using technology

Connecting Trigonometric Operations and Trigonometric Functions

Characteristics of Function Families
The Function Concept of Change
Comparing and Contrasting Linear, Quadratic, and Exponential Rate of Change
Qualitative analysis of representations of functional relationships
Algebraic Equivalence
Sequences and Series

Framing our Work

Informed by the Standards for Preparing Teachers of Mathematics (AMTE, 2017)

Professional Noticing of Students’ Thinking in a Technology-Mediated Environment

Purpose: To consider how PSMTs notice students’ mathematical thinking when asked to focus on both students’ mathematical understanding as well as their engagement when working in a technology-mediated environment.

Methods

Conceptual Framework

Participants: 37 PSMTs
Data: Written noticing assignment ➔ students’ working within a technology-mediated learning environment
Analysis: Coded statements for each component of the framework as well as the coordination among them.

Findings and Implications

- It was easier for PSMTs to attend and interpret the students’ mathematical thinking than for them to attend and interpret the students’ engagement with the technology.
- It was even more difficult for PSMTs to coordinate the students’ thinking and their engagement with the tool.
- Findings suggest the need for PSMTs to have more experiences developing the practice of noticing student work in technology-mediated environments.

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