EXPLORING THE CONNECTIONS BETWEEN THE PRACTICES OF PRESERVICE TEACHERS AND THEIR MATHEMATICAL KNOWLEDGE AND DISPOSITIONS

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OUR GOAL FOR MATHEMATICS TEACHER EDUCATION: WELL-STARTED BEGINNERS

Preparing elementary teachers of mathematics who are ready for responsible professional work with students from the day they assume responsibility for classrooms of their own through learning experiences that integrate and advance:

- Mathematical Knowledge for Teaching (MKT)
- Productive mathematical dispositions
- Skill with essential teaching practices

… all with room (and tools!) for further growth and development

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ZOOMING IN ON OUR STUDY

The field acknowledges that mathematical knowledge and mathematical dispositions impact teaching, but how and in what way?

How are teachers' eliciting and/or interpreting of a student thinking impacted by their mathematical knowledge and/or dispositions?

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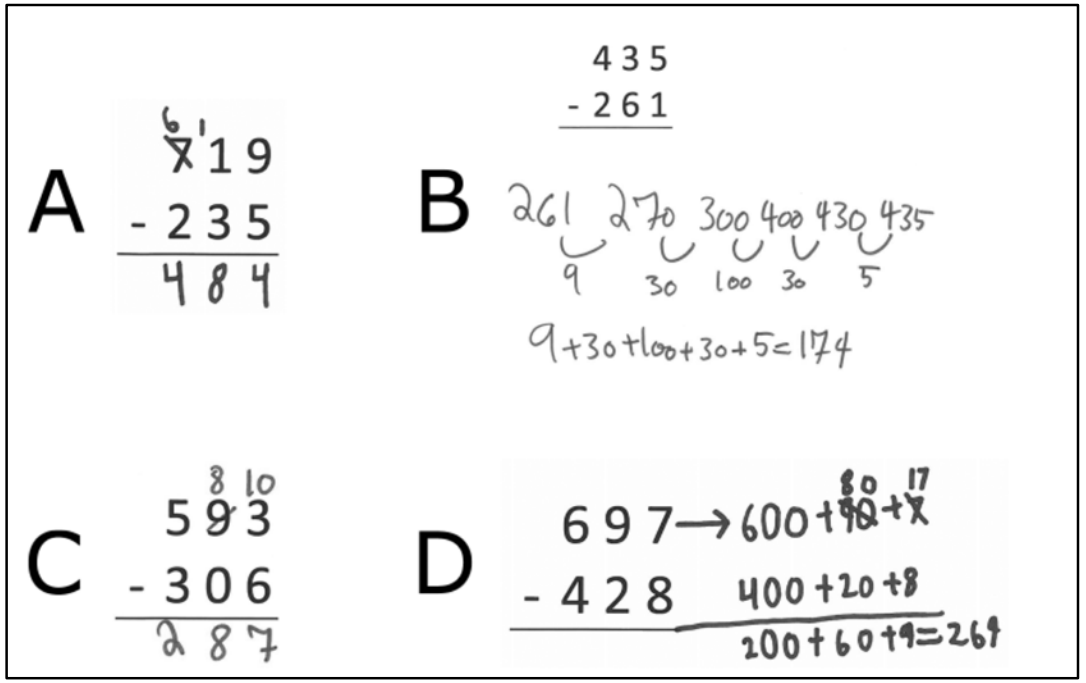
STUDY DESIGN

- **Participants:** 24 preservice teachers, range of points in the teacher education program
- **Data Collection Part 1:**
  - Measure of knowledge of four specific subtraction approaches
  - Measure of disposition towards four subtraction approaches

AN EXAMPLE: STUDENT APPROACHES TO SUBTRACTION

Showing mathematical knowledge though:

- Describing the steps of the process and their sequence
- Justifying and generalizing
- Applying the approach to another problem



Showing mathematical dispositions toward the process through responses to questions:

- Is the approach sensible?
- Would you use the process yourself?

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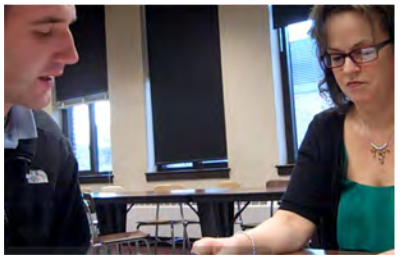
STUDYING THE CONNECTION OF MKT, DISPOSITION, AND TEACHING PRACTICE

Simulations are approximations of practice that can be used to study the connections among MKT, disposition, and teaching practice.

Simulations:

- are commonly used in many professional fields
- place authentic, practice-based demands on a participant
- purposefully suspend or standardize some elements of the practice-based situation
- can provide insights that are not possible or practical to determine in real-life professional contexts



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STUDY DESIGN

- **Participants:** 24 preservice teachers, range of points in the teacher education program
- **Data Collection Part 1:**
  - Measure of knowledge of four specific subtraction approaches
  - Measure of disposition towards four subtraction approaches
- **Data Collection Part 2:**
  - Three simulation assessments, including the following situations:
    - one that was strong math knowledge & positive disposition
    - one that was weak math knowledge & negative disposition
    - one that was strong math knowledge & negative disposition

STRUCTURE OF THE TEACHING SIMULATION

The preservice teacher

1. Prepares for an interaction with a standardized student about one piece of student work
2. Interacts with the "student" with the goal of eliciting the student's process and understanding of the process and related mathematical ideas
3. Interprets the student's thinking in a follow up interview, using evidence from the interaction

ELICITING AND INTERPRETING PROCESS

- Performances were almost uniformly strong across variations in knowledge and disposition
- Thus eliciting and interpreting of the process did not appear to be impacted by differences in knowledge or disposition

ELICITING OF THE STUDENT'S UNDERSTANDING

Stronger knowledge of the mathematics of the algorithm and having a positive disposition towards the algorithm (relative to other algorithms) both had a positive impact

Why? Mathematical knowledge of the algorithm may support PSTs in identifying understandings to ask about (and in posing a question focused on that understanding)

Why? Positive disposition towards the algorithm may result in PSTs knowing that the algorithm is understandable and that it is worthwhile to ask questions to ask about it

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INTERPRETING THE STUDENT'S UNDERSTANDING (OPEN ENDED)

Stronger knowledge of the mathematics of the algorithm relative to other algorithms had a positive impact on interpreting the student's understanding. Disposition did not appear to impact.

Why? Mathematical knowledge of the algorithm may support PSTs in identifying understandings to make inferences about and in making sense of evidence gathered

Why? Disposition towards the algorithm may influence the persistence of questioning, but have less of an impact on its focus

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INTERPRETING THE STUDENT'S UNDERSTANDING (PREDETERMINED)

Positive disposition towards the algorithm relative to other algorithms had a positive impact on interpreting the student's understanding of a specific idea. Mathematical knowledge did not appear to impact.

Why? Positive disposition towards the algorithm may support PSTs in trusting/not discounting the understandings conveyed about the approach

Why? Knowledge is still in play, but providing the focus may accentuate the influence of disposition on remembering/forgetting, trusting/discounting the information

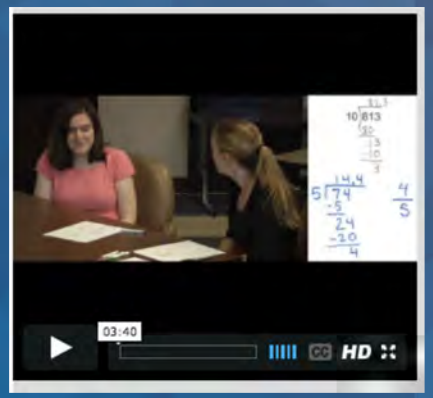
IMPLICATIONS FOR MATHEMATICS TEACHER EDUCATION

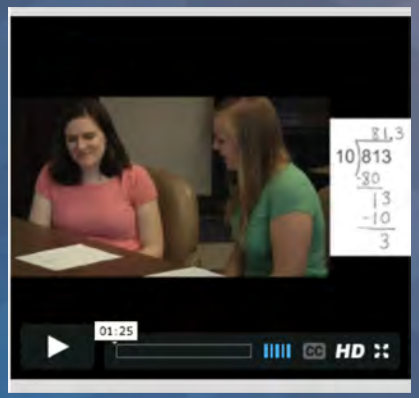
Since both MKT and productive dispositions influence eliciting and interpreting, preservice teachers need opportunities to develop both through:

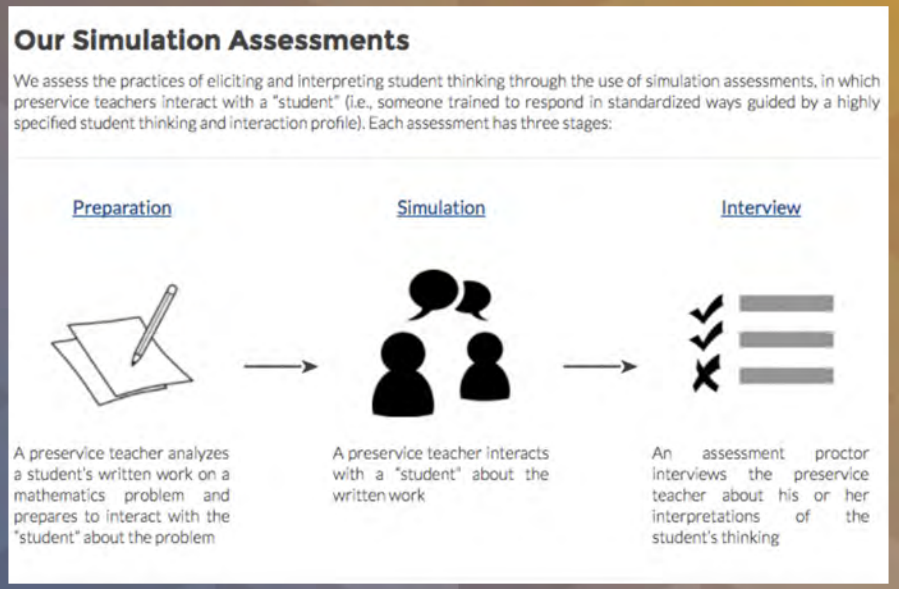
- Eliciting and interpreting student thinking about particular and strategically varied mathematical processes
- Frameworks and pedagogies of practice that enhance mathematical knowledge and mathematical disposition
- Collective work to note the impacts of a lack of mathematical knowledge and/or negative disposition
- Proportionally greater focus on understanding and building on skills with eliciting and interpreting mathematical processes

QUESTIONS? WANT MORE INFORMATION?

http://sites.soe.umich.edu/at-practice/







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