CONNECTING MATHEMATICAL KNOWLEDGE AND DISPOSITIONS WITH PEDAGOGICAL SKILLS

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Acknowledging our colleagues on this study: Merrie Blunk, Rosalie DeFino, Erin Pfaff, Xueying Ji Prawat, & Emily Theriault-Kimmey

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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

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?

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

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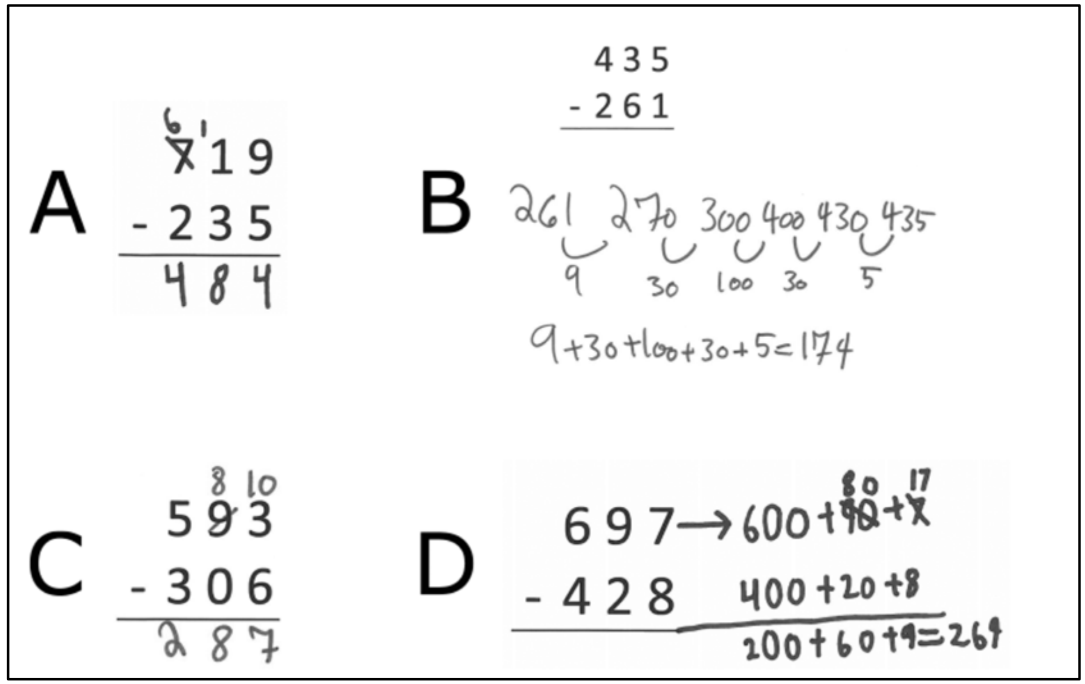
AN EXAMPLE: STUDENT APPROACHES TO SUBTRACTION

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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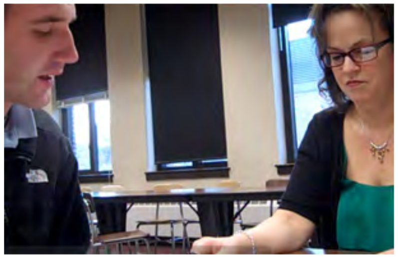
STUDYING THE CONNECTION OF MKT, DISPOSITION, AND TEACHING PRACTICE

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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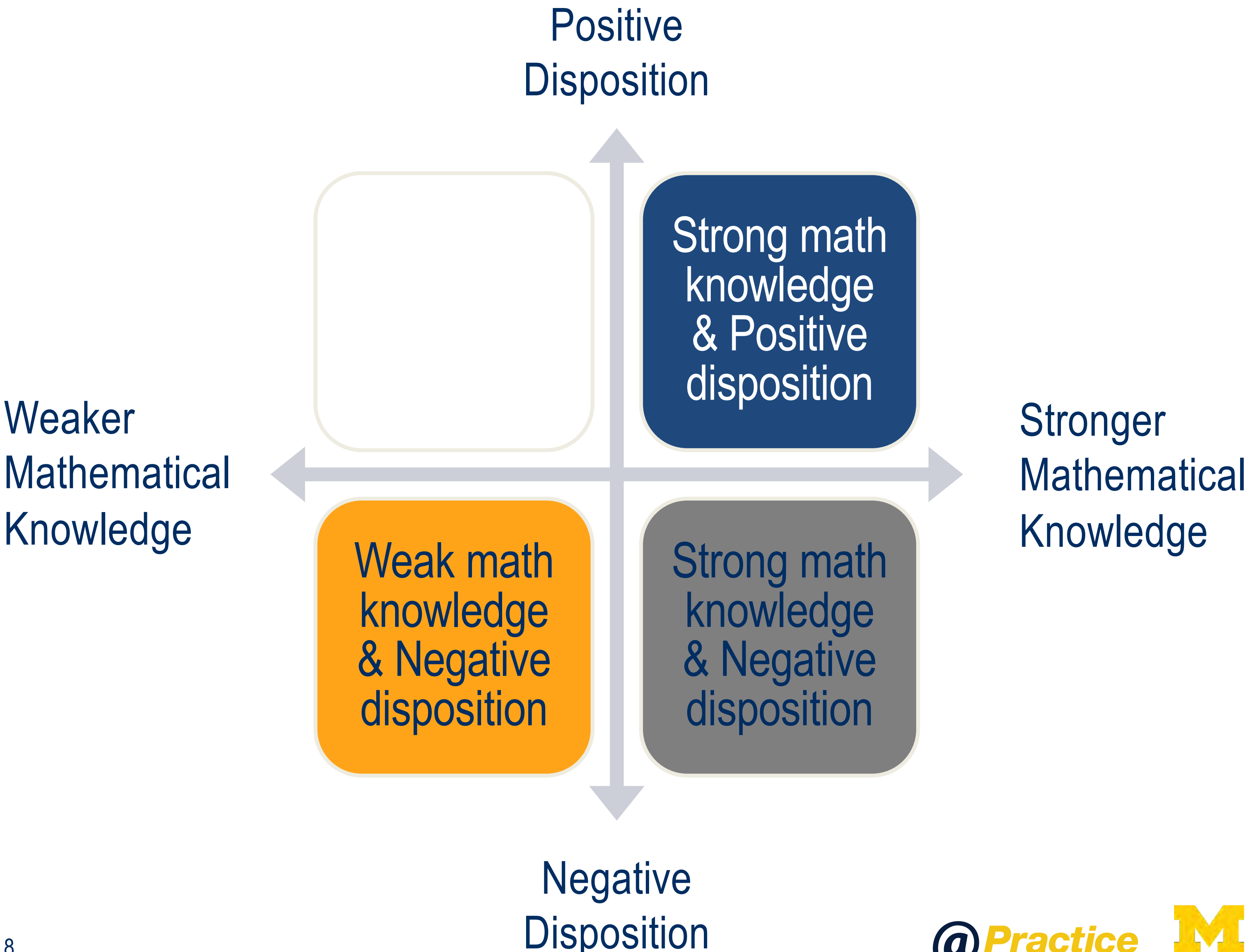
STUDY DESIGN

- **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:
    - one that was high preference/high mathematical knowledge
    - one that was low preference/low mathematical knowledge
    - one that was low preference/high mathematical knowledge

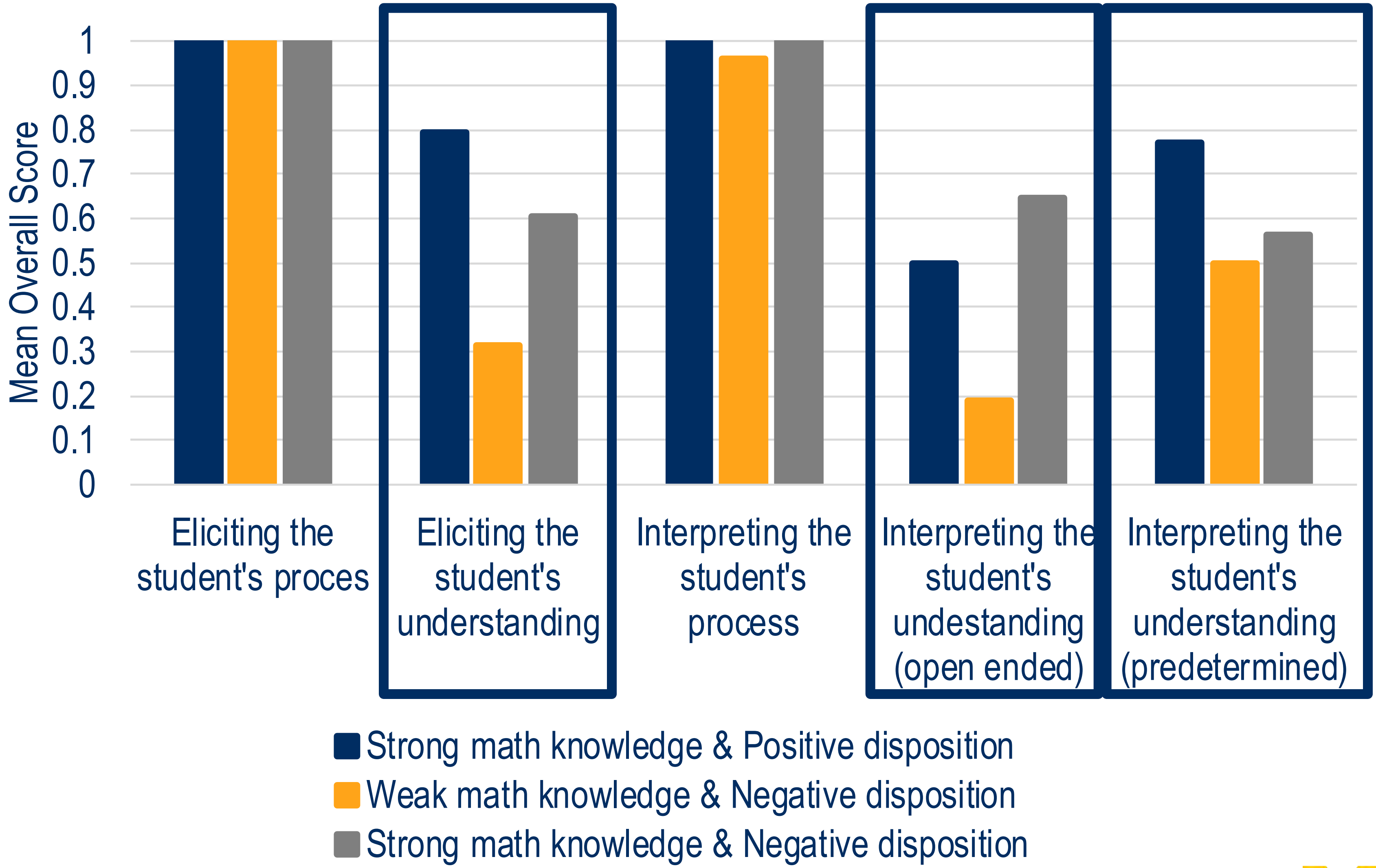

Positive Disposition
Strong math knowledge & Positive disposition
Weaker Mathematical Knowledge
Stronger Mathematical Knowledge
Weak math knowledge & Negative disposition
Strong math knowledge & Negative disposition
Negative Disposition

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” to elicit the student’s thinking
3. Interprets the student’s thinking in a follow up interview, using evidence from the interaction

FINDINGS



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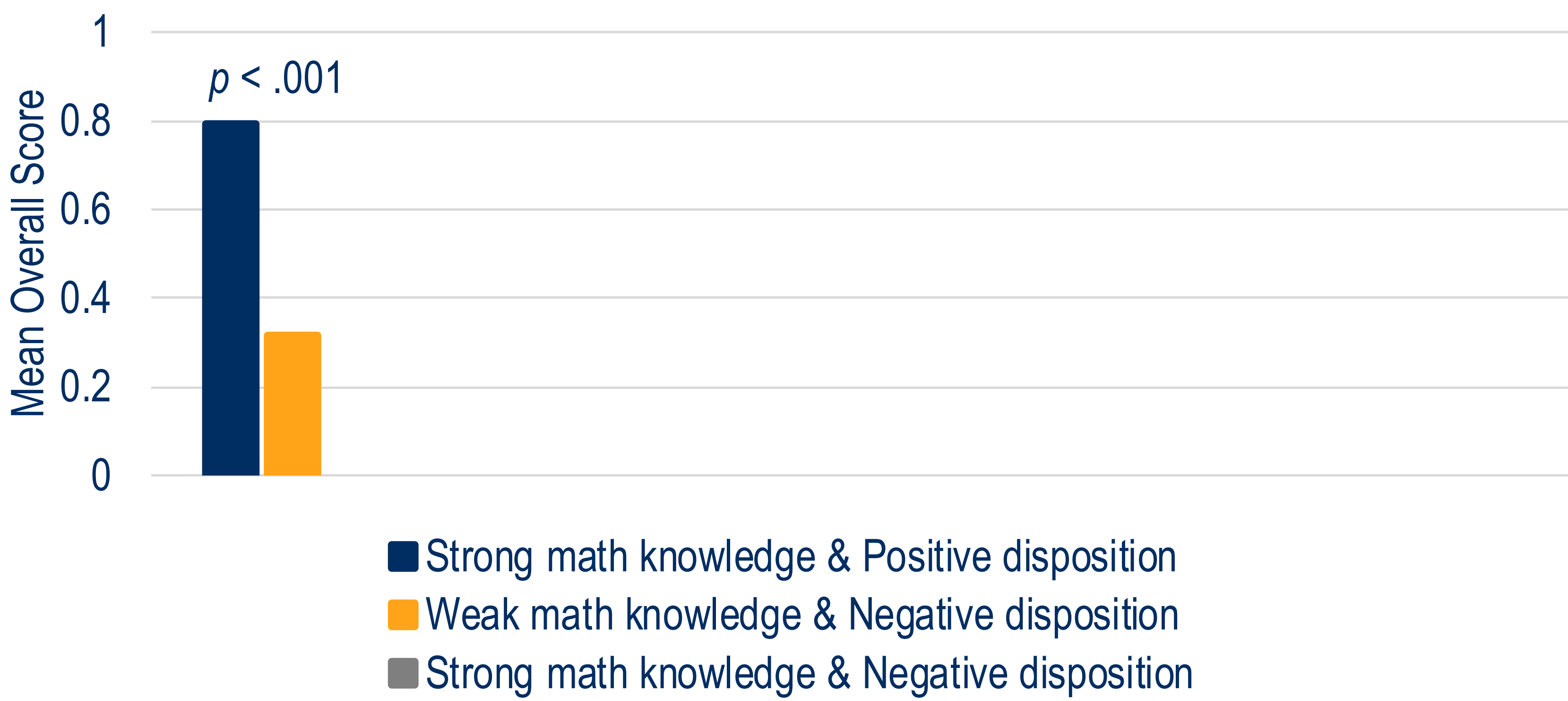
ELICITING OF THE STUDENT'S UNDERSTANDING

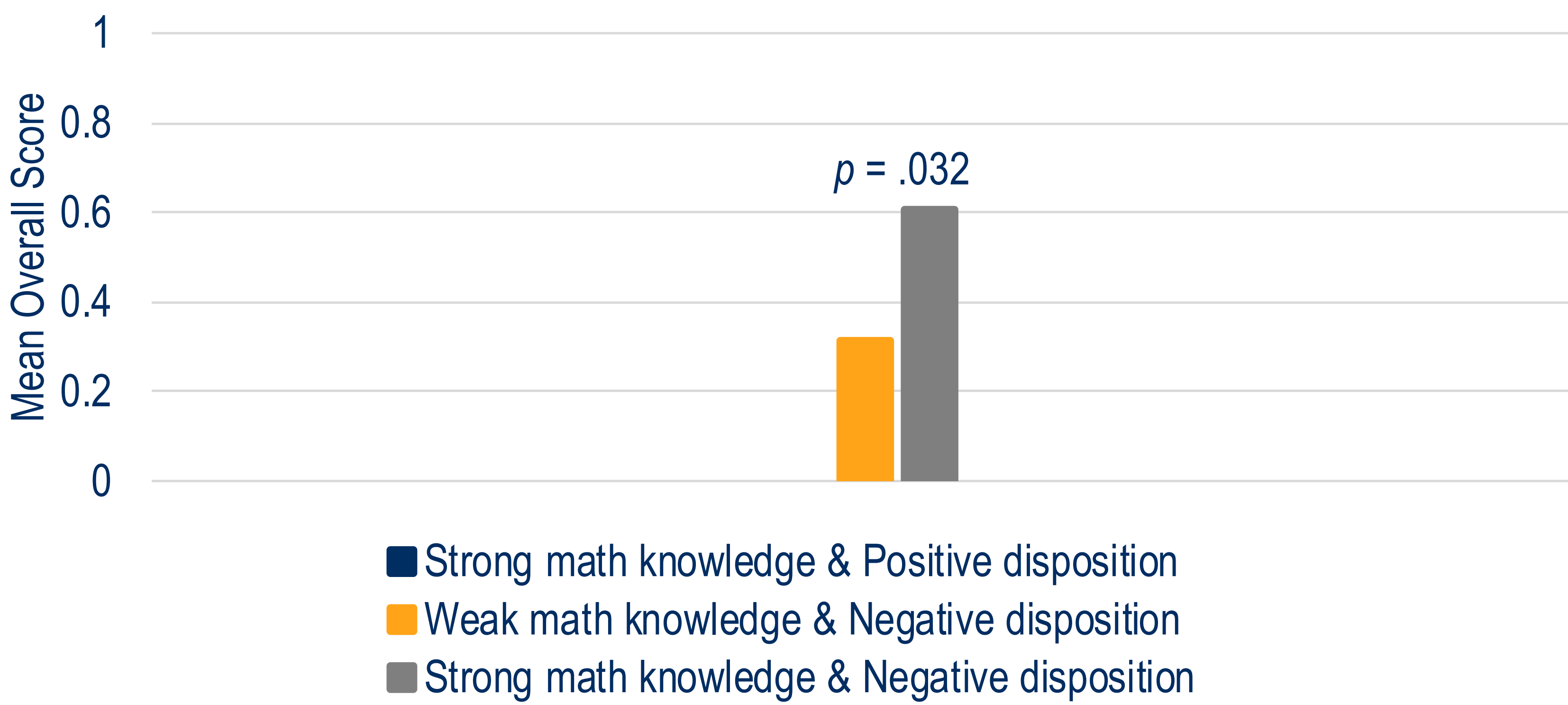
Eliciting the student's understanding was stronger in a strong math knowledge/positive disposition situation compared to a weak math knowledge/negative disposition situation



ELICITING OF THE STUDENT'S UNDERSTANDING

Does mathematics knowledge matter when disposition is about the same?

Eliciting the student's understanding was stronger when math knowledge was strong compared to a weak math knowledge situation



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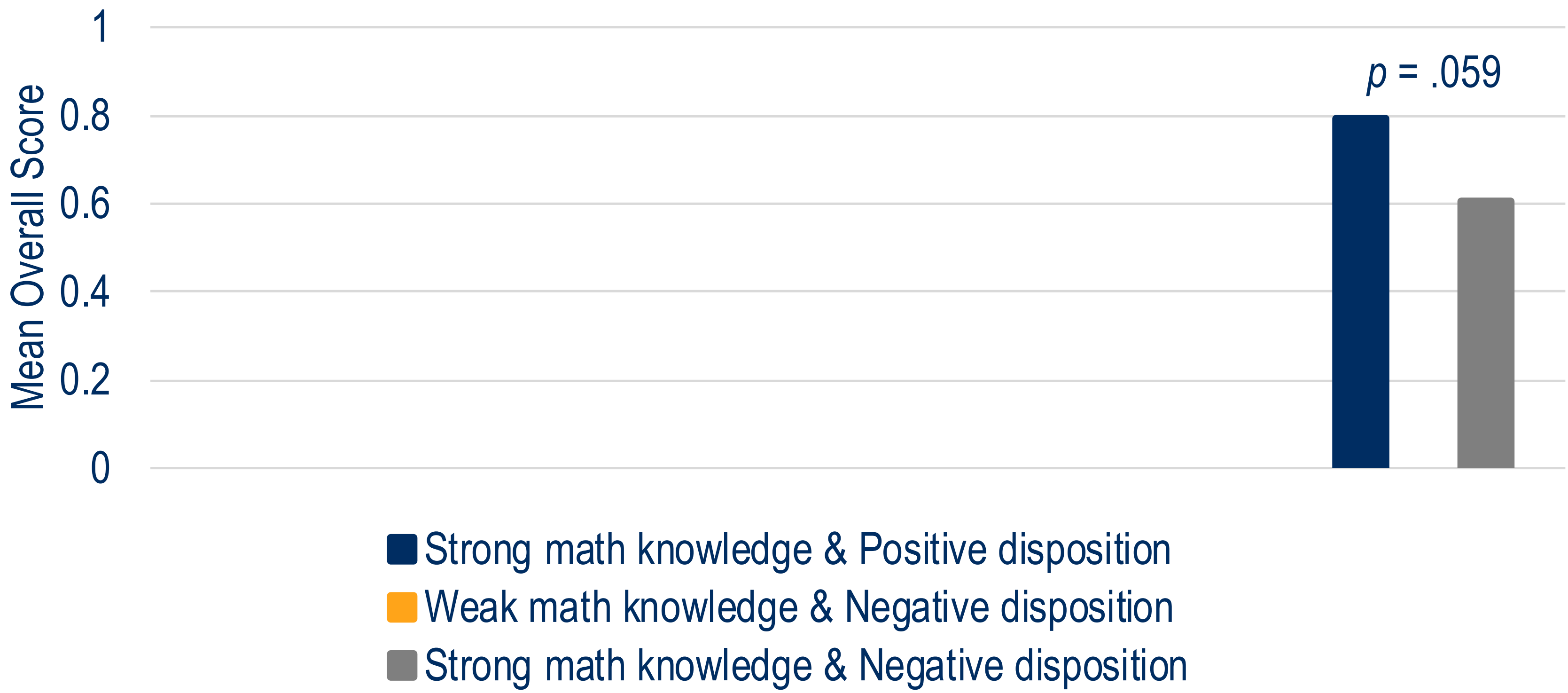
ELICITING OF THE STUDENT'S UNDERSTANDING

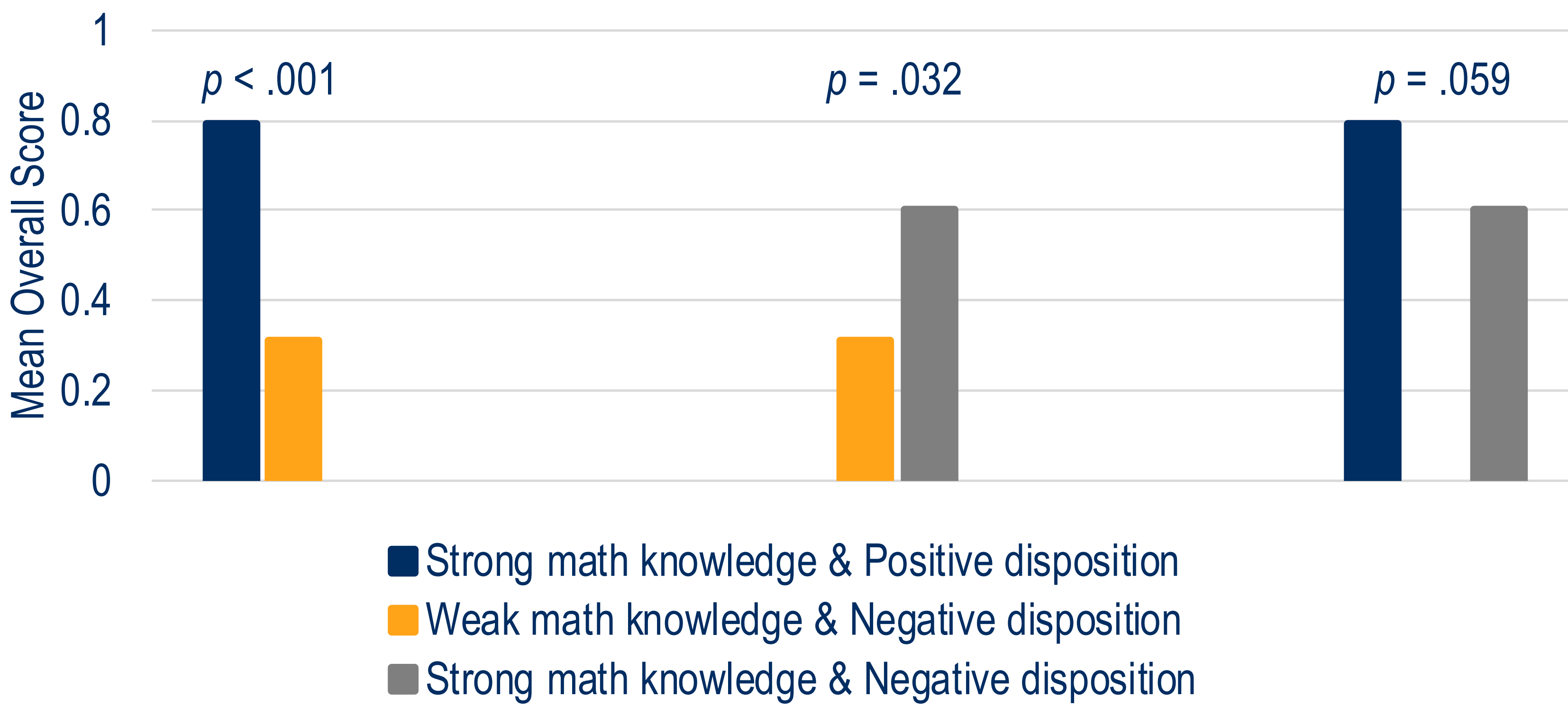
Does disposition matter when math knowledge is about the same?

Eliciting the student's understanding was stronger in a positive disposition situation compared to a negative disposition situation (*marginally significant)*



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 on eliciting the student’s understanding.



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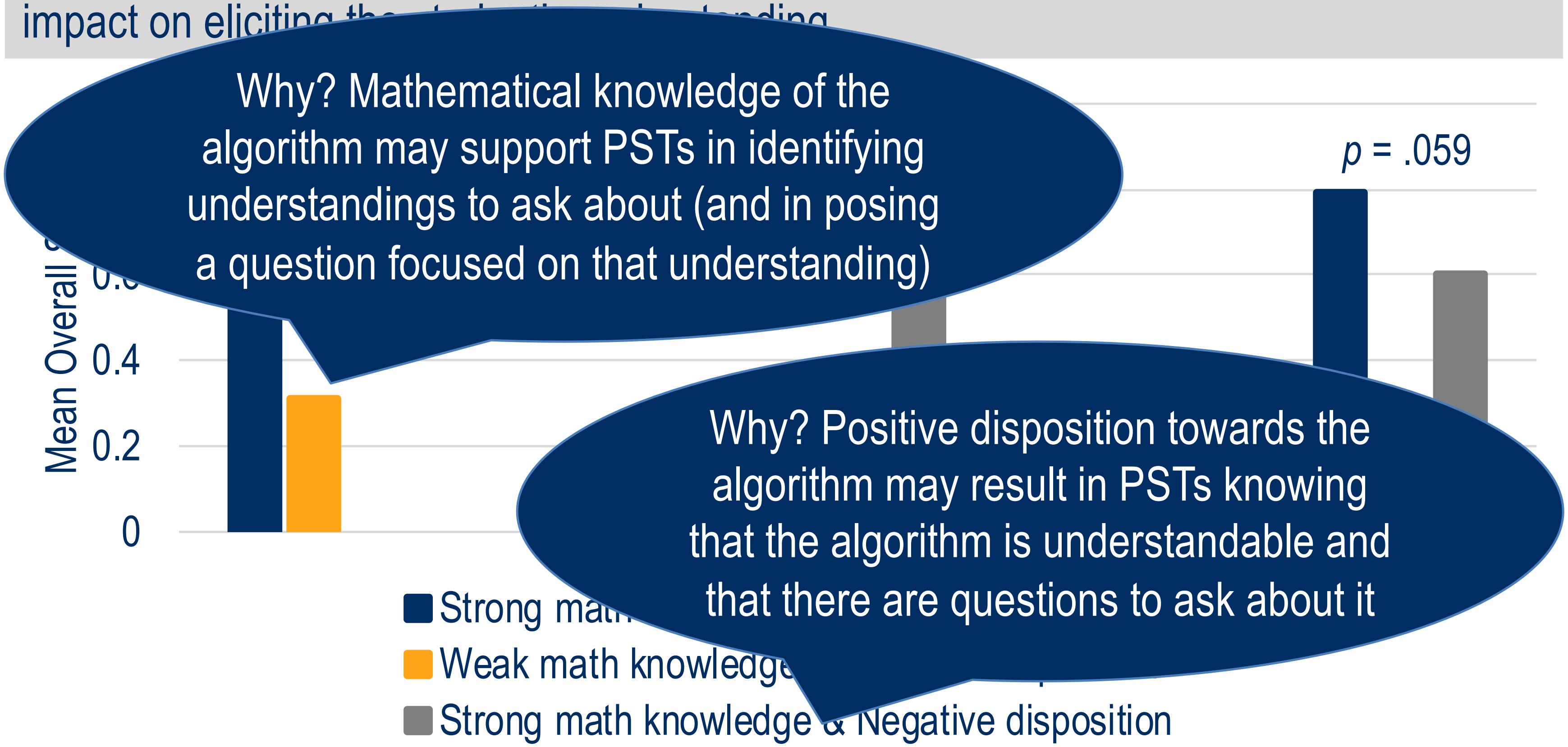

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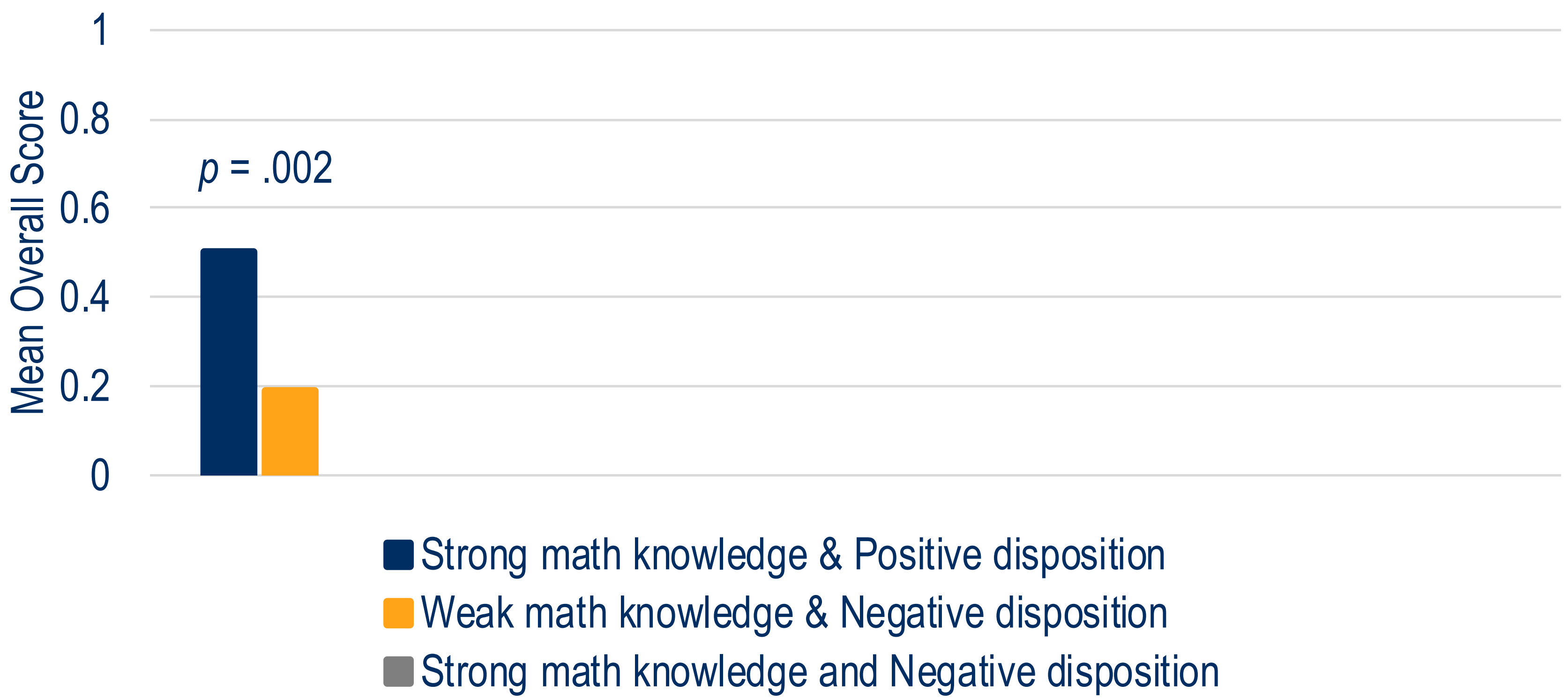
INTERPRETING THE STUDENT'S UNDERSTANDING (OPEN ENDED)

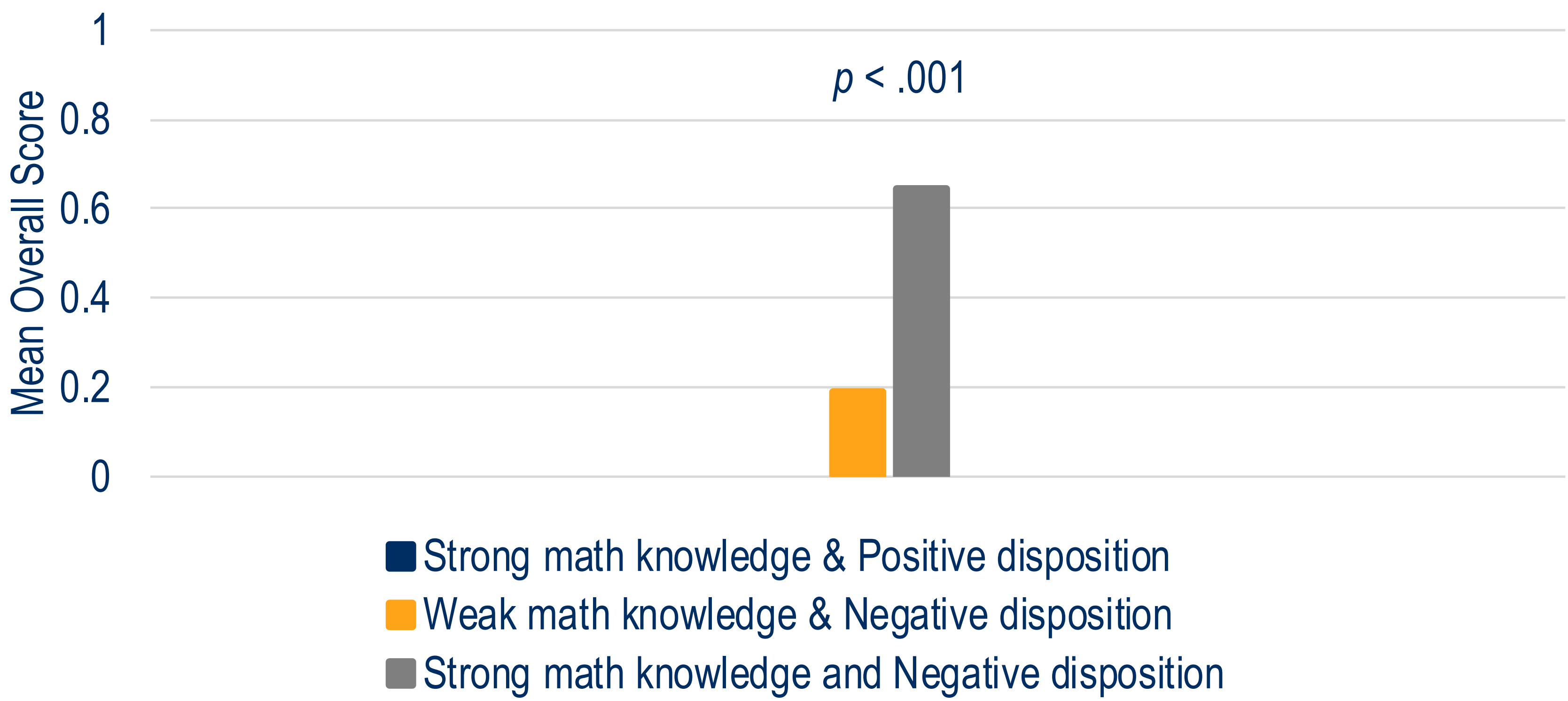
Interpreting the student's understanding was stronger in a strong math knowledge/positive disposition situation compared to a weak math knowledge/negative disposition situation



INTERPRETING THE STUDENT'S UNDERSTANDING (OPEN ENDED)

Does mathematics knowledge matter when disposition is about the same?

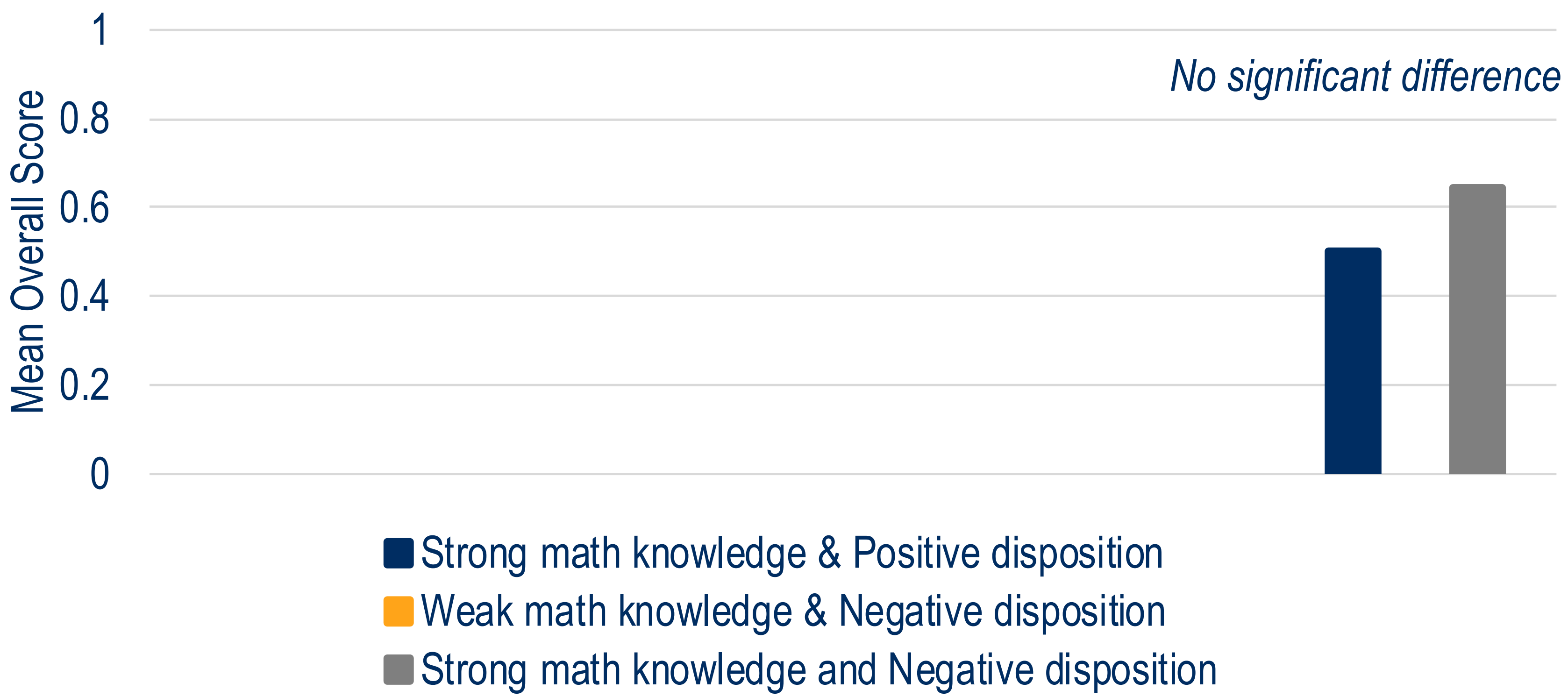
Interpreting the student's understanding was stronger when math knowledge was strong compared to a weak math knowledge situation



INTERPRETING THE STUDENT'S UNDERSTANDING (OPEN ENDED)

Does disposition matter when math knowledge is about the same?

Disposition did not appear to impact interpreting the student's understanding



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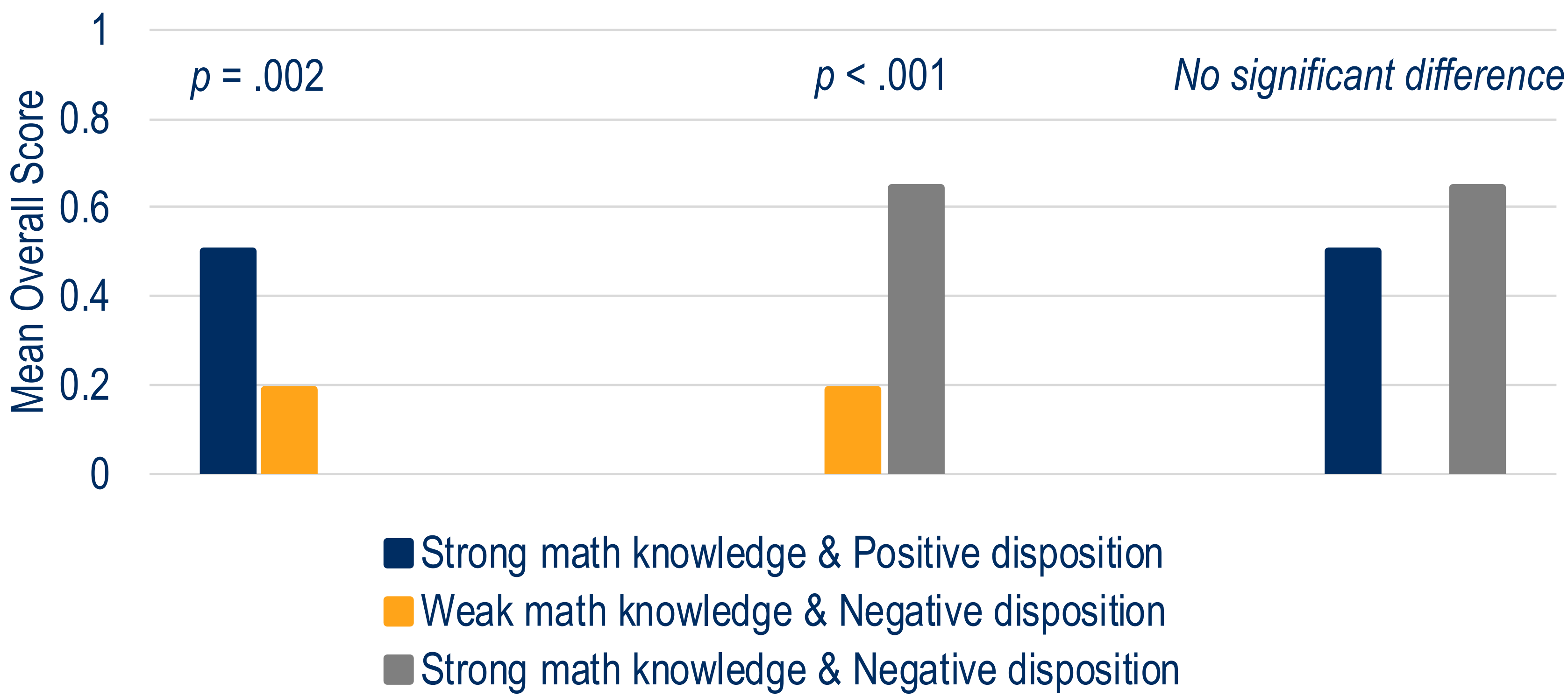
INTERPRETING THE STUDENT'S UNDERSTANDING (OPEN ENDED)

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.



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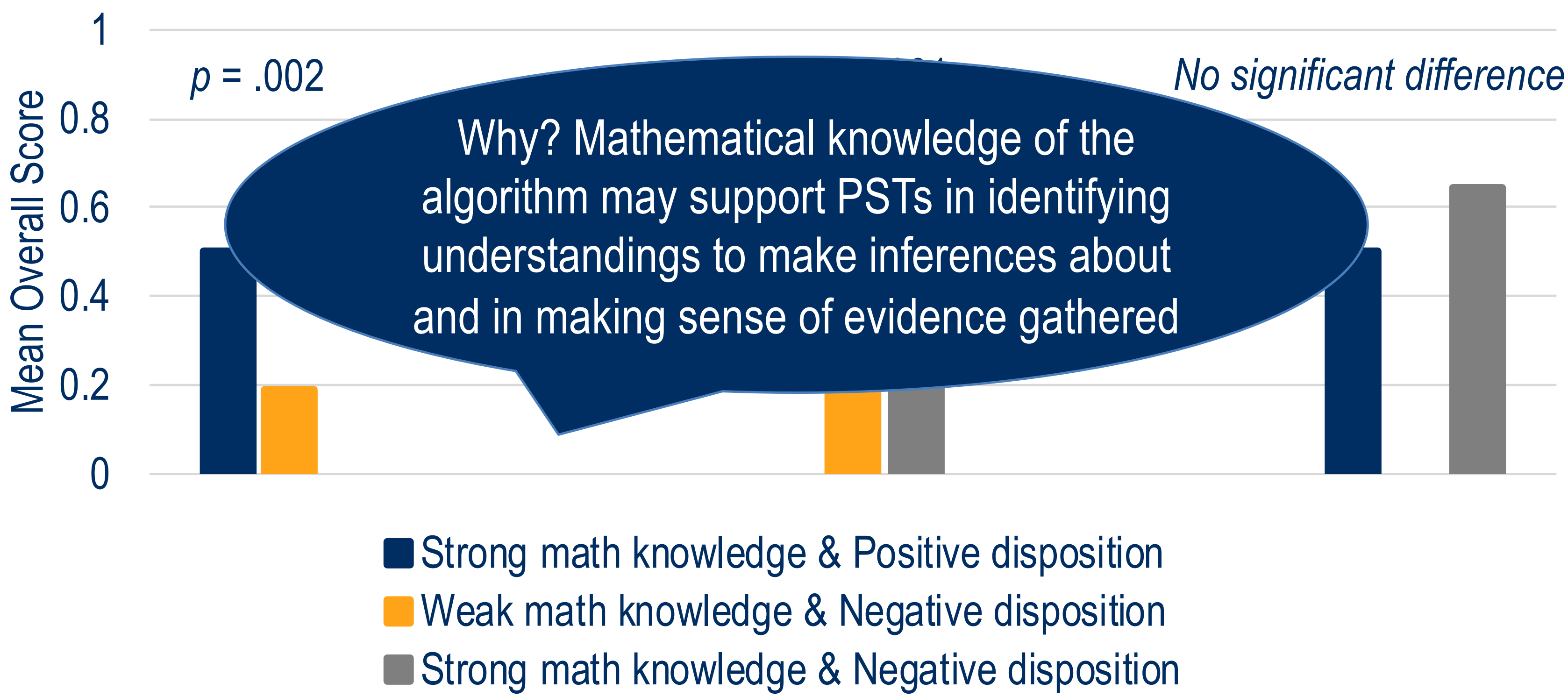

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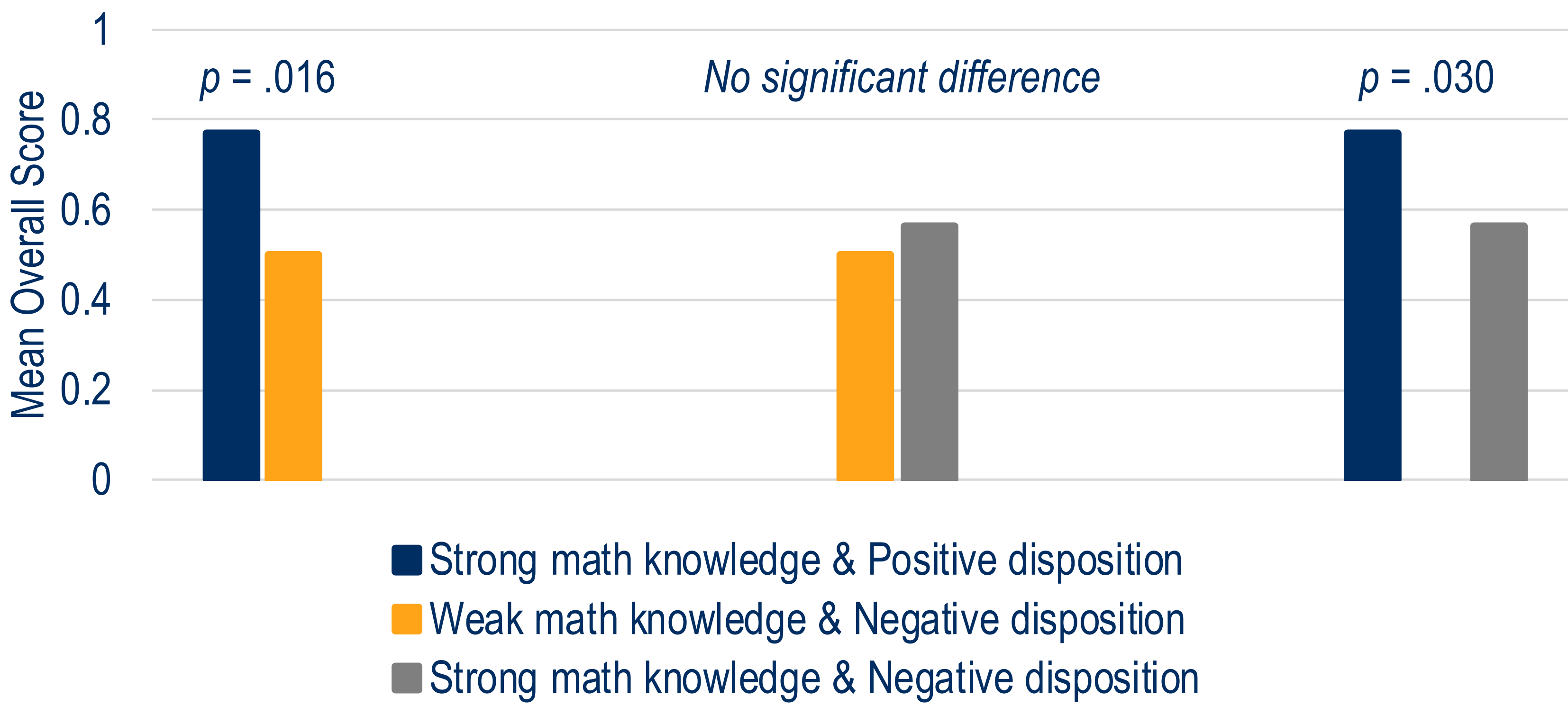
INTERPRETING THE STUDENT'S UNDERSTANDING (PREDETERMINED)

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.



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INTERPRETING THE STUDENT'S UNDERSTANDING (PREDETERMINED)

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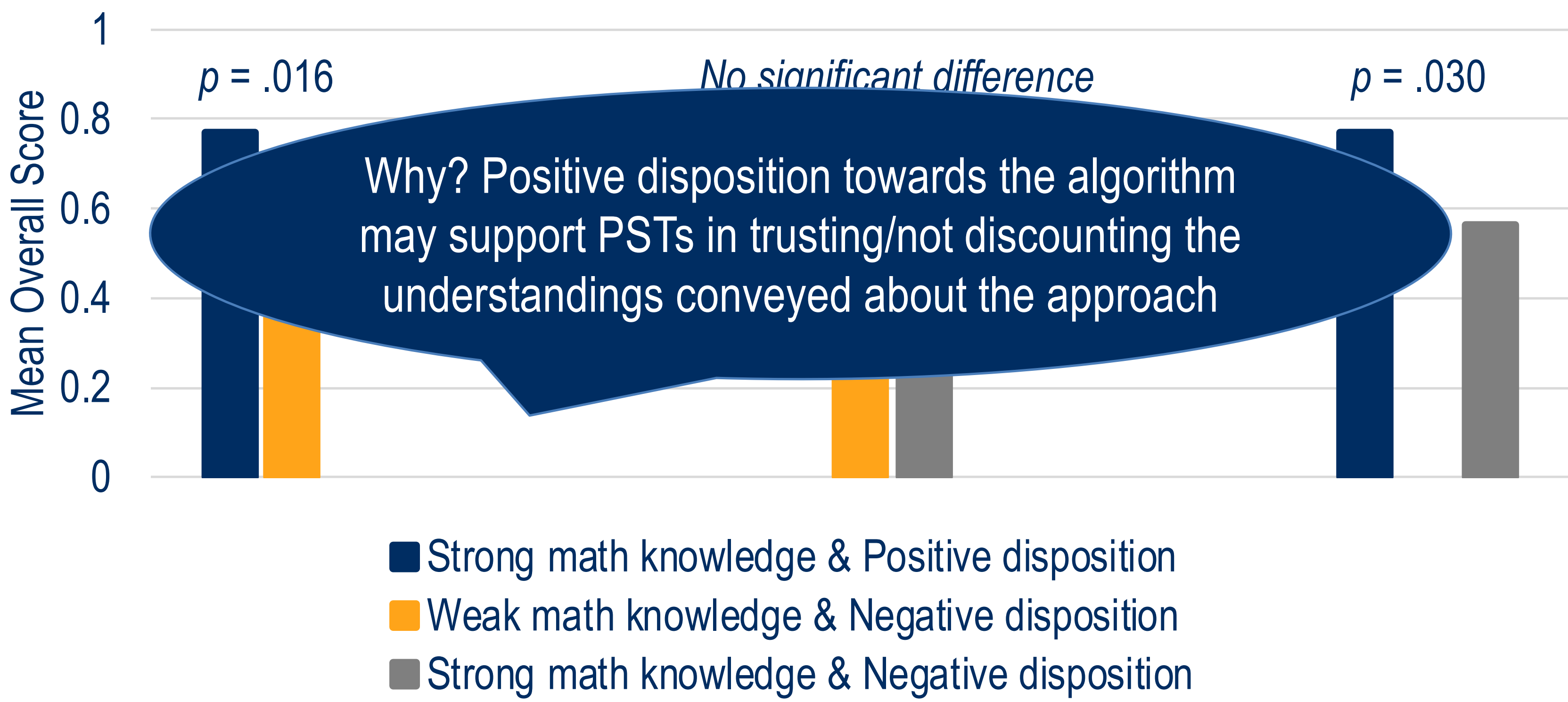

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QUESTIONS FOR CONSIDERATION

- What are some possible explanations for the findings…
  - **Eliciting and interpreting process**: not markedly impacted by differences in knowledge or disposition.
  - **Eliciting understanding:** impacted by differences in knowledge and disposition.
  - **Interpreting understanding (open ended):** impacted by differences in knowledge, but not disposition
  - **Interpreting understanding (predetermined):** impacted by differences in disposition, but not knowledge
- What are some implications of these findings for TE?

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QUESTIONS? WANT MORE INFORMATION?

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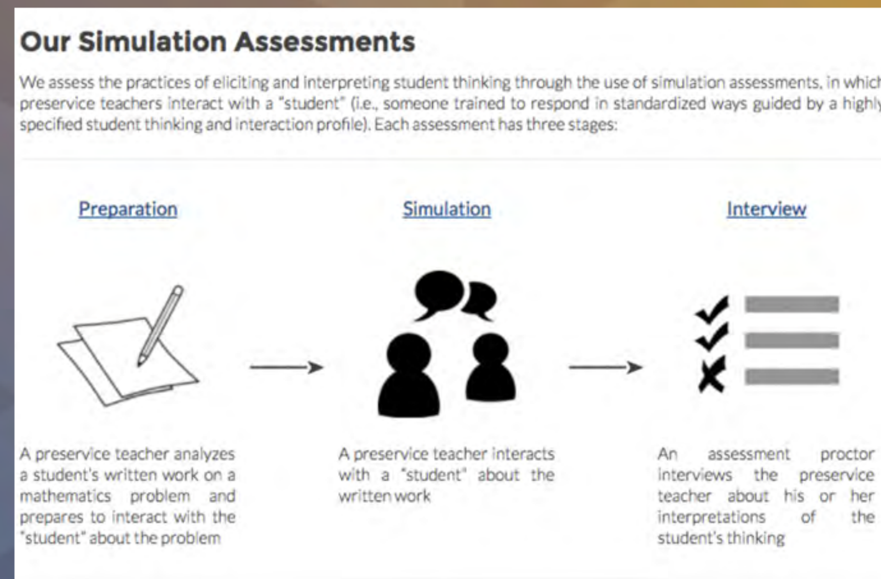

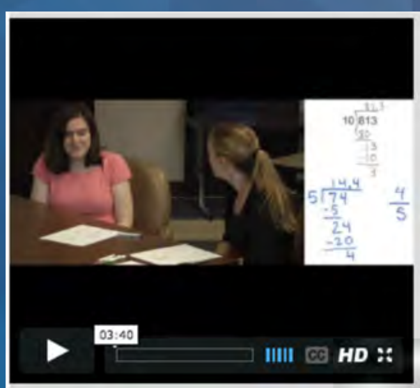

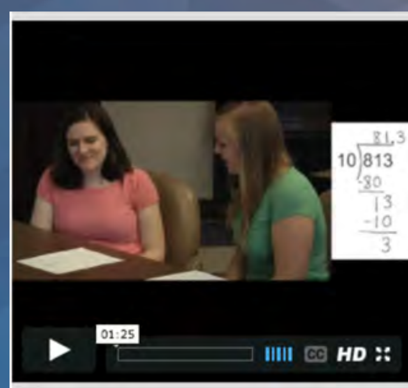

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