

# INTERPRETING STUDENT THINKING: PRESERVICE TEACHERS' INFERENCES AND THEIR USE OF SUPPORTING EVIDENCE

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## BACKGROUND

- **Decomposition of Practice:** Teaching can be broken down into smaller parts that can be taught, studied, and rehearsed by preservice teachers. The parts must maintain their integrity so that they can be reintegrated into the practice of teaching (Grossman & Shahan, 2005).
- **Interpreting Student Thinking:** A teacher practice that entails characterizing what a student thinks based on evidence from the student's words, actions, or writing. Such characterizations can be used as the basis for future teaching.
- **Simulations:** A situation that represents a context of practice with fidelity and elicits authentic professional work. Used in the preparation of professionals in other fields. Focus on the doing of teaching while standardizing important contextual factors that impact both teaching and ability to appraise its quality.



## RESEARCH FOCUS

- Early attention to interpreting is crucial because errors in focus, scope, and/or evidence are likely to result in teaching that is less supportive of student learning.
- What skills and capabilities related to interpreting student thinking in mathematics do preservice teachers bring to a teacher education program? How prevalent are evidence-based interpretations that focus on core processes and understandings?

## METHODS

- Participants: 23 preservice elementary teachers in the first week of a teacher education program.
- Simulation assessment.
- Analyzed interpretations focusing on:
  - The mathematical process used by the student;
  - The student's understanding of the process;
  - Anticipating method and understanding of work on a similar problem; and
  - Marshalling available evidence to support claims.

## SIMULATION ASSESSMENT

Preservice teachers' engage in three parts:

- **Preparation:** Preparing for an interaction with one standardized student about a specific piece of student work.
 
$$\begin{array}{r} 78\cancel{4} \\ - 3\cancel{1}5 \\ \hline 469 \end{array}$$
- **Simulation:** Eliciting and probing the standardized student's thinking to understand the steps the student took, why the student performed the steps, and the student's understanding of the key mathematical ideas.
- **Interview:** Interpreting the student's thinking and using evidence from the interaction to:
  - Describe the student's process for solving the problem.
  - Describe the student's understanding of the process.
  - Use the student's process to solve a similar problem:  $761 - 342$ .
  - Anticipate the student's understanding of particular parts of the process
    - What the little "2" means (digit values).
    - Why the student changes both the minuend and subtrahend (compensation).

### Student Role Protocol to Standardize the Assessment

#### What the student is thinking

- Uses an algorithm that is not conventional in the U.S. which entails adding the same amount to the minuend and subtrahend to keep the difference the same.
- Applies the method correctly.
- Knows that the difference between the numbers remains the same.
- Understands that the procedure creates a subtraction problem that has the same answer as the original problem.
- Understand the answer as the difference between two numbers.
- Understands that 10 ones is equivalent to 1 ten.

#### General orientations towards responses such as:

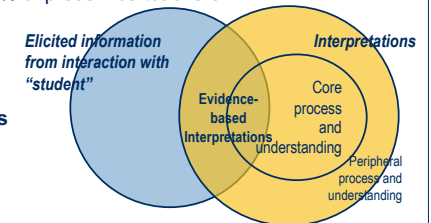
- Talks about digits in columns in terms of the place value of the column (e.g., 14 ones).

#### Responses to anticipated questions

## FINDINGS: THE NATURE AND PREVALENCE OF PRESERVICE TEACHERS' INTERPRETING

- **Accurately described the student's process for solving the problem:** 87% of preservice teachers.

Different types of interpretations



- **Described the student's understanding of the process**
  - Accurately described peripheral understandings with evidence: 43%.
  - Inaccurately described the student's understandings: 22%.
  - Accurately described a "core" understanding without evidence: 22%.
  - Accurately described a "core" understanding with evidence: 4%.
- **Accurately anticipated the student's process on similar problem:** 96% of preservice teachers.
- **Anticipates the student's understandings of particular parts of the process in the follow-up problem.**

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	Digit values	Compensation
Recognizes the need for more information before anticipating	56%	30%
Anticipates understanding incorrectly or without evidence	35%	61%
Anticipates understanding with evidence	4%	4%

## CONCLUSIONS

- Preservice teachers can use written work and interaction with a "student" to describe the student's process and anticipate the application of the process to a similar case.
- Preservice teachers may experience more challenges in interpreting a "student's" understanding, such as
  - Identifying core components of understanding in need of attention.
  - Using evidence to support claims about understanding.
  - Remembering information that could be used as evidence for claims about core components of understanding.

\*The research reported here was supported by the National Science Foundation through grant #1502711 to the University of Michigan. The opinions, findings, and recommendations expressed are those of the authors and do not represent views of the National Science Foundation.