UNDERSTANDING PRACTICES THAT PRESERVICE TEACHERS USE TO ELICIT STUDENT THINKING

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CHALLENGES FOR TEACHER PREPARATION

- Students, families, and schools need beginning teachers who are ready for classroom practice
- Teacher education needs to focus on core practices of teaching (Ball & Forzani, 2009; Grossman et al., 2009; Lampert & Graziani, 2009; MacDonald, Kazemi, & Kavanagh, 2013)
- Teacher educators would benefit from knowing more about the knowledge and skills that preservice teachers bring to teacher preparation

ORIENTING PROFESSIONAL PREPARATION TO WHAT PRESERVICE TEACHERS' BRING

If we knew more about the skills of those entering teacher education, we could reconsider:

- The curriculum (things that need to be learned and "unlearned")
- Settings for teacher learning and needed resources
- Recruitment

We could also better track on their developing skill

ELICITING STUDENT THINKING

A core teaching practice: to find out what students know or understand, and how they are thinking/reasoning

- Establishing an environment in which a student is comfortable sharing his/her thinking
- Posing questions to get students to talk
- Listening to and hearing what students say
- Probing students' responses
- Developing an idea of what a student thinks
- Checking one's interpretation

MOVES USED WHEN ELICITING STUDENT THINKING

Teachers often question in ways that do not elicit how students are thinking/reasoning

- Closed questions (Brualdi, 1999)
- Evaluate responses instead of probing (Mehan, 1979)
- Ask questions leading students to think in a particular way (Woods, 1998)

Further, preservice teachers often

- Pose series of questions without taking up what students say
- Teach, instead of probe, incorrect answers (Moyer, 2002)

FOCUSING ON ELICITING FROM THE BEGINNING OF TEACHER EDUCATION

Early attention to eliciting and interpreting student thinking is crucial, because:

- People are likely to develop ways of doing this in everyday life
- Caring about what students think is foundational to teaching
- It is foundational to many other teaching practices

LEARNING WHAT PRESERVICE TEACHERS BRING

- To have such information, we must assess practice: actual skills and knowledge for doing teaching
- Information gathered must:
  - Provide information about the skills that preservice teachers bring to initial teacher preparation
  - Provide information about their instructional needs
- Results will enable efficient and wise use of time and other resources

ASSESSMENT OPTIONS FOR INTERACTIVE PRACTICES

- **Field-based assessments** that capture teaching in K-12 settings
  - Support appraisal of teaching practices enacted in light of the unique demands of a particular situation
- **Simulation assessments** that capture teaching in a predetermined teaching-like situation
  - Support appraisal of teaching practices enacted a standardized context

OVERVIEW

① Using a simulation to surface the eliciting moves of preservice teachers

② Zooming in on a particular eliciting move - "filling in a student's thinking"

③ Distinguishing "filling in" from other teaching moves

④ Considering implications of moves such as "filling in" for teacher education

① USING A SIMULATION TO LEARN ABOUT PRESERVICE TEACHERS' SKILLS WITH ELICITING MATHEMATICAL THINKING

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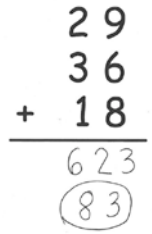
SIMULATION ASSESSMENTS

A situation that represents a context of practice with enough fidelity to elicit authentic professional work.

- Used in other professional fields (e.g., medicine, nursing, dentistry) as well as in most skilled occupations where skill, knowledge, judgment, and client safety are concerns
- Can be used to portray situations about which participants are provided with different degrees of relevant background information
- Potential advantages
  - Parity
  - Detail
  - On demand

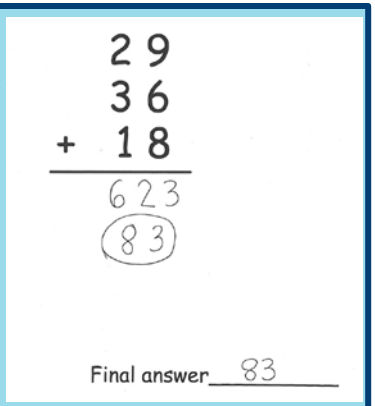
SETTING THE STAGE FOR ELICITING



The preservice teacher:

1. **Prepares for an interaction with a standardized student about one piece of student work**

Your goal is to elicit and probe to find out what the "student" did to produce the answer as well as the way in which the student understands the steps that were performed.



Correct answer, alternative algorithm, degree of understanding is unclear

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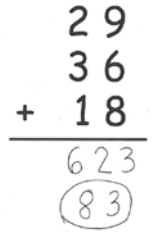
HOW IS EVIDENCE OF ELICITING SKILLS OBTAINED?



The preservice teacher:

1. Prepares for an interaction with a standardized student about one piece of student work
2. **Interacts with the student to probes the standardized student's thinking**




A Standardized Student

Developed response guidelines focused on:

- What the student is thinking such as
  - Uses an alternative algorithm (column addition), except the student is working from left to right
  - Applies the method correctly and has conceptual understanding of the procedure
- General orientations towards responses such as
  - Talk about digits in columns in terms of the place value of the column (e.g., 23 ones)
  - Give the least amount of information that is still responsive to the question
- Responses to anticipated questions

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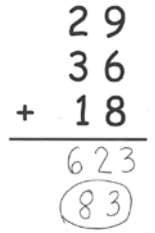
ELICITING STUDENT THINKING: VIEWING FOCUS

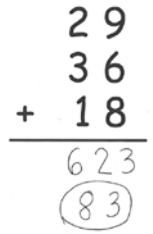


What can we notice about this preservice teacher's skill with eliciting student thinking?

Evaluate whether the preservice teacher:

- Launches the interactions with a question that is neutral, open, and focused on student thinking
- Elicits the specific steps of the student's process
- Elicits the student's understanding of the steps
- Attends to the students' ideas in follow-up questions
- Uses appropriate tone and manner

ELICITING A STUDENT'S THINKING



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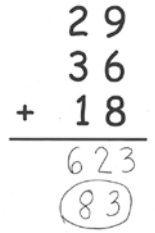

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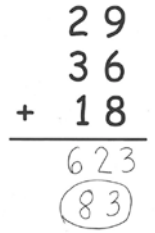

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② ZOOMING IN ON A PARTICULAR ELICITING MOVE – "FILLING IN A STUDENT'S THINKING"

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INITIAL SKILL IN ELICITING STUDENT THINKING

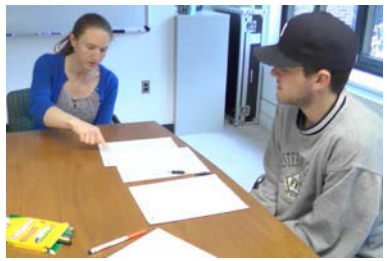
Context:

- 2013 baseline simulation assessment (48 preservice teachers)
- Data collected during the first week of the TE program

Analyzing the prevalence of eliciting moves:

- Eliciting components of the student's process
- Probing the student's understanding of the process
- Encouraging and attending to what the student says and writes
- Posing a purposeful follow-up problem



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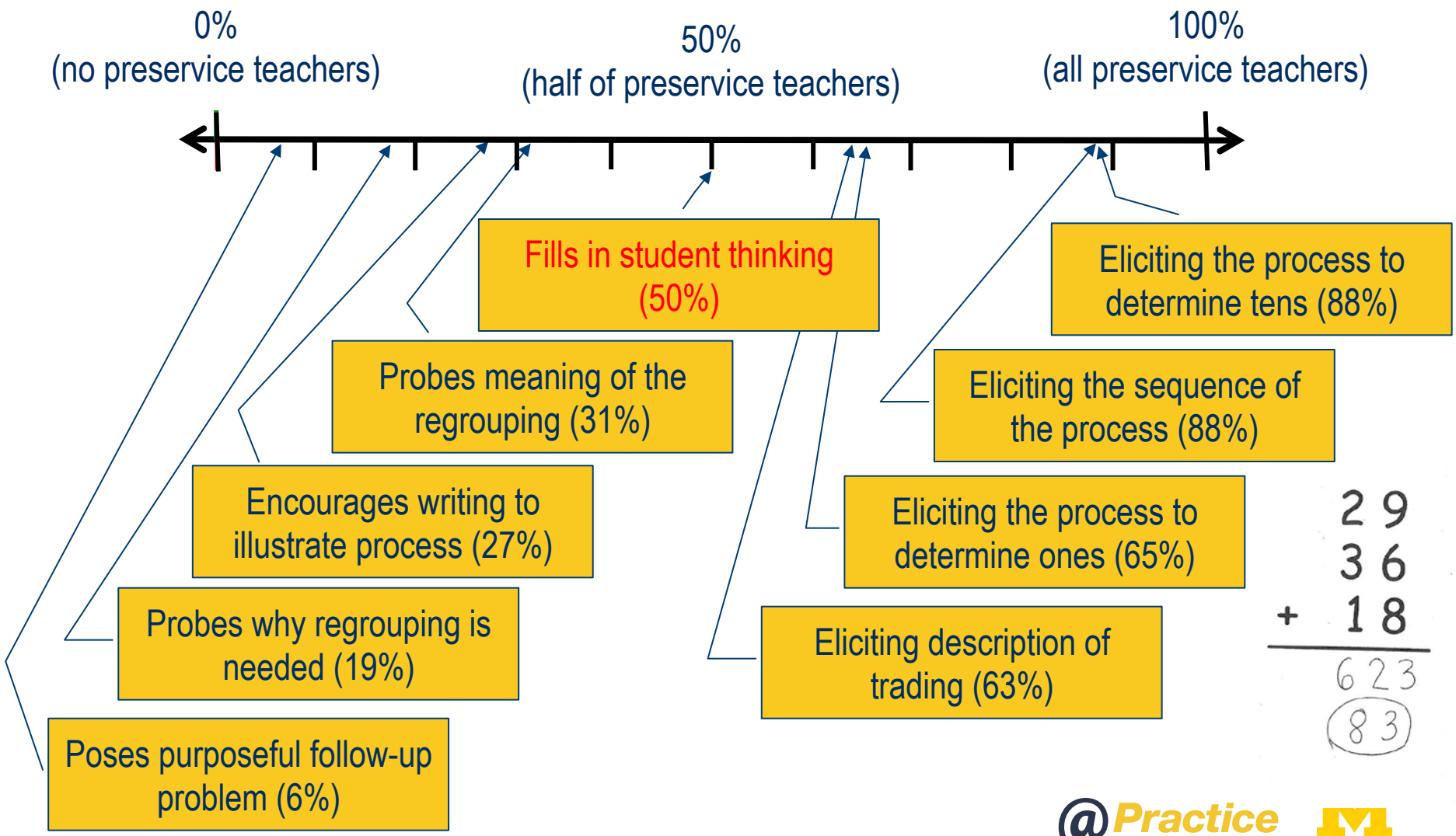
PREVALENCE OF MOVES: ELICITING UNDERSTANDING



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FILLING IN A STUDENT'S THINKING

Filling in a student's thinking is a move in which a teacher states what she believes the student is thinking, but has not yet shared, to elicit a confirmation from the student.

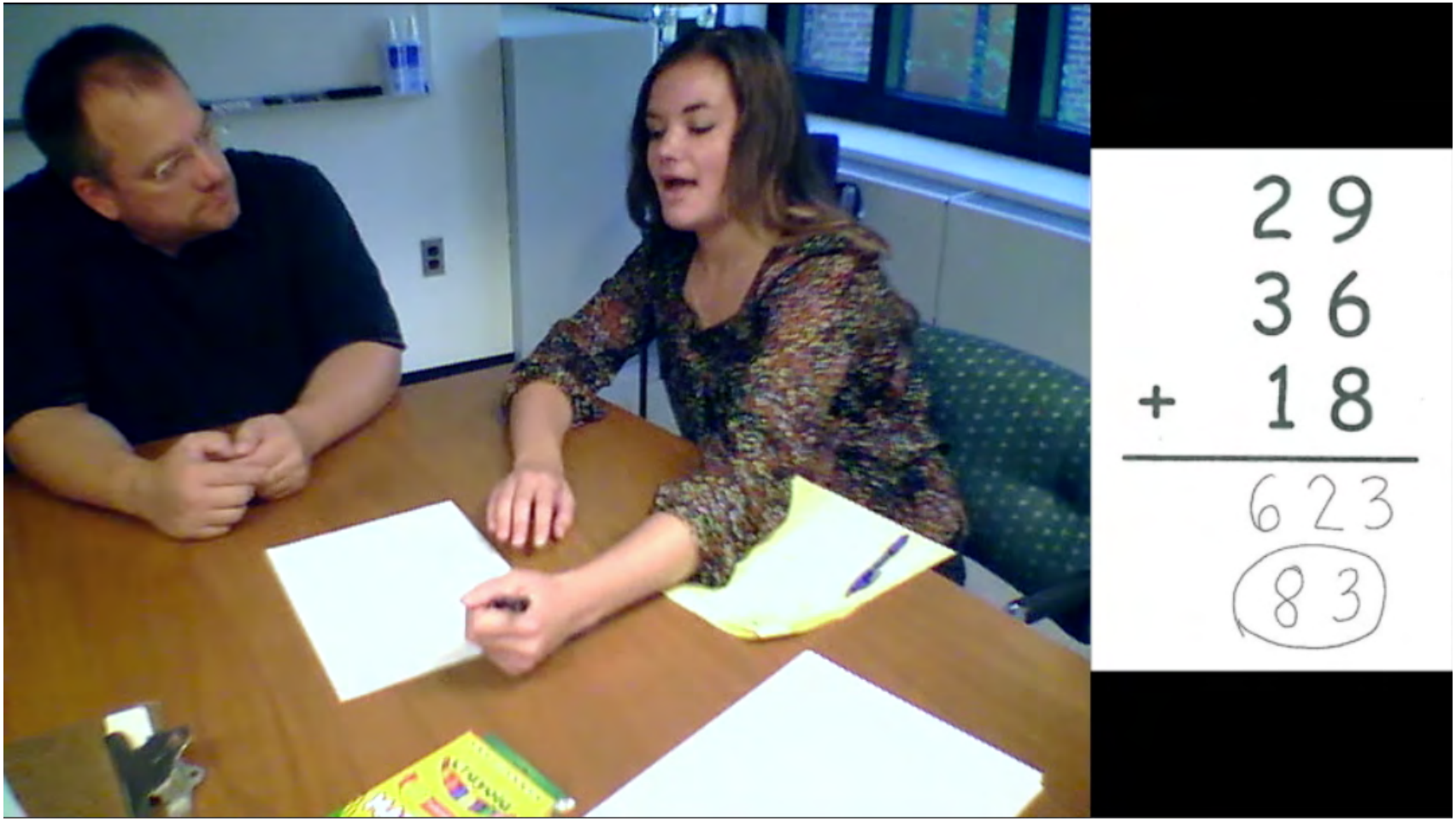
This move is

- A convergent/closed prompt use to elicit a short or single word response from the student
- Contingent on the teacher's sense of the student's ideas, approach or reasoning and anticipation of unspoken/unwritten components
- Used in many situations for many purposes

Focus in the following example on

what the teacher is doing and learning…

AN EXAMPLE OF "FILLING IN A STUDENT'S THINKING"



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WHAT IS A TEACHER DOING WHEN FILLING A STUDENT'S THINKING?

In this situation

- Drawing inferences from what is written
- Implying the sequence of the work
- Describing a process using particular mathematical ideas and language
- Connecting a process with a representation of that process
- Seeking confirmation
- Discounting other plausible explanations
- …

In other situations other aspects of thinking may be "filled" including strategies, reasoning, concepts, contextual cues

WHAT IS A TEACHER LEARNING WHEN FILLING A STUDENT'S THINKING?

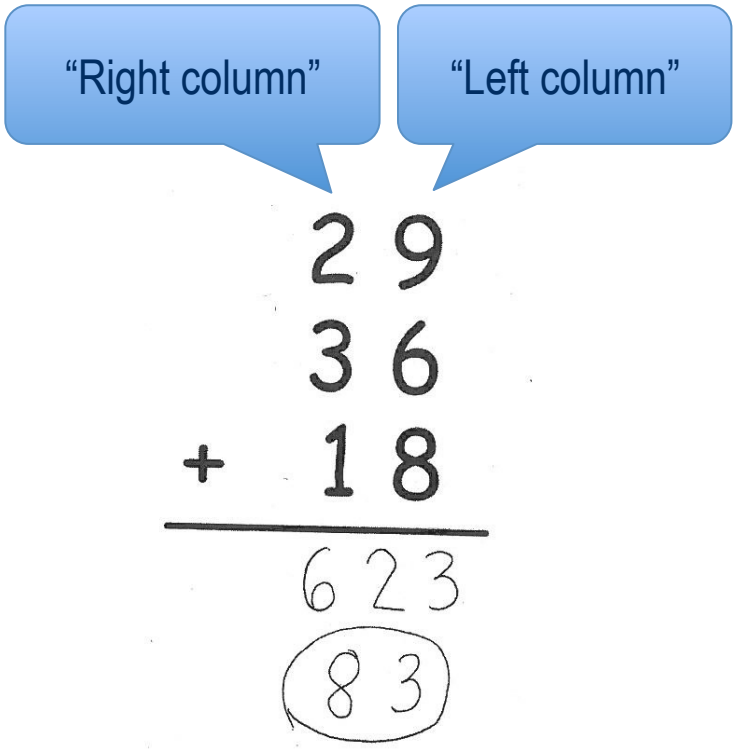
What is the teacher learning about the student's thinking?

- The student's agreement or disagreement with how her/his thinking is being characterized

What is the teacher not learning?

- The student's skill in articulating her/his thinking
- The mathematical language a student would use
- Cues from the student that signal there is something more to learn
- *Perhaps the student's actual ideas*

BARRIERS INTRODUCED BY FILLING IN A STUDENT'S THINKING



TEACHING PURPOSES FOR FILLING IN A STUDENT'S THINKING

Given the challenges presented by filling, why might a preservice teacher choose to use this move?

- To "help" a student talk through something that is complex or that the student may have trouble articulating
- To expedite the interaction (time pressure)
- To avoid barriers along the way to the "point" of the eliciting
- To encourage a particular line of thinking
- Knowledge of, or fluency with, alternative prompts/approaches limits options

Are there occasions when moves like filling in a student's thinking are generative?

③ DISTINGUISHING "FILLING IN" FROM OTHER TEACHING MOVES

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BORDERLINE CASES OF FILLING IN A STUDENT'S THINKING

Recall: *Filling in a student's thinking is a move in which a teacher states what she believes the student is thinking, but has not yet shared, to elicit a confirmation from the student.*

What about cases in which:

- The teacher poses a follow up problem to confirm what a student has already shared?
- The teacher revoices something that the student has already said?
- The teacher formulates a prompt using language that is assumed to be shared?

CASE #1: FOLLOW UP PROBLEMS

Purpose: Collecting information to confirm insights into student's thinking

Filling in a student's thinking is a move in which a teacher states what she believes the student is thinking, but has not yet shared, to elicit a confirmation from the student.

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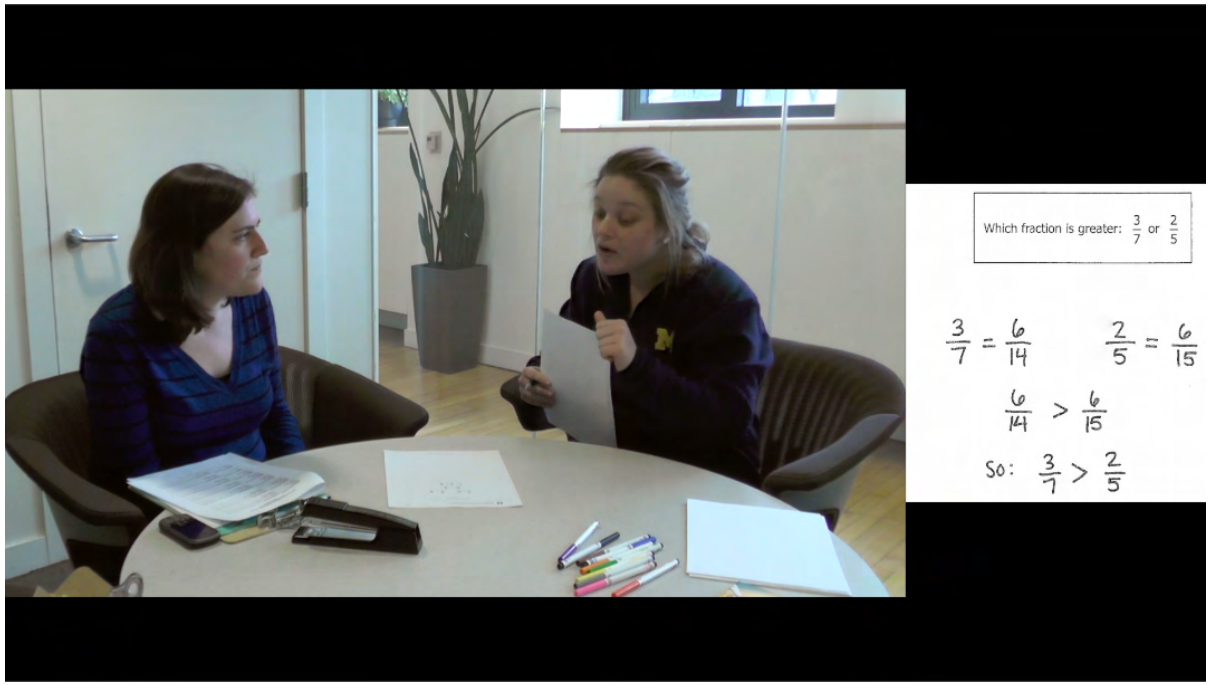
CASE #2: REVOICING

$\frac{3}{7} = \frac{6}{14}$ $\quad\quad$ $\frac{2}{5} = \frac{6}{15}$

$\frac{6}{14} > \frac{6}{15}$

So: $\frac{3}{7} > \frac{2}{5}$

Purpose: Confirming what a student said or meant



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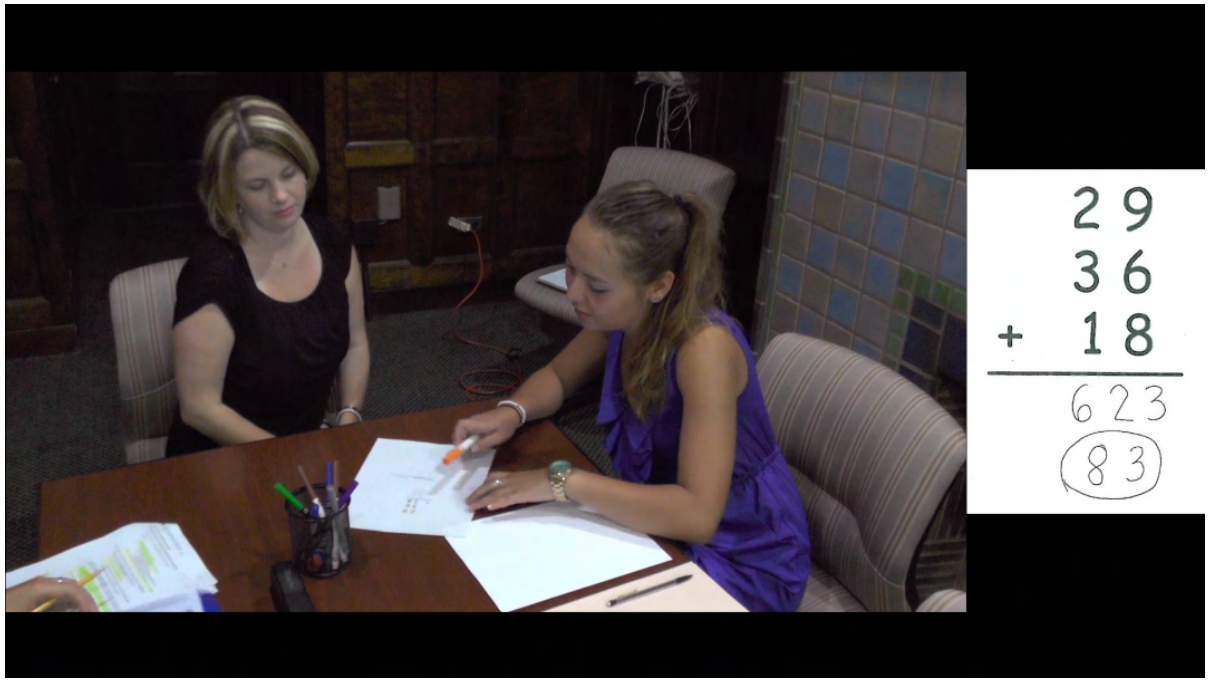
CASE #3: TAKEN-AS-SHARED IDEAS

Purpose: Framing prompts in meaningful and also efficient ways



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INSIGHTS FROM BORDERLINE CASES

When eliciting, teachers can and should use what they know about student thinking, being attentive to/ cautious about:

- Extending those insights into new situations
- Fidelity to what the students have said and shown they think
- Assumptions about what student already knows, including mathematical language

④ CONSIDERING IMPLICATIONS OF MOVES SUCH AS "FILLING IN" FOR TEACHER EDUCATION

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SUPPORTING THE LEARNING OF PRESERVICE TEACHERS

Teacher educators can support preservice teachers by:

- Using pedagogies that help preservice teachers become aware of the practice of filling in a student's thinking
- Discussing the pitfalls of filling in a student's thinking, including the impact on subsequent/contingent teaching practices
- Encouraging the development of alternative practices that better serve the instructional purpose when "filling" might be used

RESEARCH

- Studying classroom situations in which teachers state students' thinking to understand the uses of such a practice and how students respond to its use
  - At different time points in the learning process (beginning of the year, early/later in a unit of study, etc.)
  - In different participation structures (individual, small group, whole class discussions)
- Studying simulation, rehearsal, and other teaching situations to understand how they may
  - Provoke filling in student thinking
  - Be designed to surface and/or to redress filling in a student's thinking