ELICITING AND INTERPRETING STUDENTS' THINKING: WHAT SKILLS DO THOSE ENTERING TEACHER EDUCATION BRING?

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CHALLENGES FOR TEACHER PREPARATION

- Students, families, and schools need beginning teachers who are ready for classroom practice.
- Beginning teachers often lack skills and knowledge needed for responsible entry-level teaching.
- Demand for teacher education to focuses on core practices of teaching (Ball & Forzani, 2009; Grossman et al., 2009; Lampert & Graziani, 2009)
- Teaching lacks performance standards for entry to independent practice
- Teacher educators lack knowledge of the knowledge and skills that candidates bring to teacher preparation

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ORIENTING PROFESSIONAL PREPARATION TO WHAT TEACHER CANDIDATES BRING

If we knew more about the initial 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

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LEARNING WHAT CANDIDATES 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 teacher candidates bring to initial teacher preparation
  - Provide information about their instructional needs
- Results will enable efficient and wise use of time and other resources

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OVERVIEW OF THE SESSION

① Unpacking the core practices of eliciting and interpreting student thinking

② Assessing skill with eliciting and interpreting students' mathematical thinking

③ Findings about skills that teacher candidates bring to teacher education

④ Next steps and discussion

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① UNPACKING THE CORE PRACTICES OF ELICITING AND INTERPRETING STUDENT THINKING



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ELICITING AND INTERPRETING STUDENT THINKING

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

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

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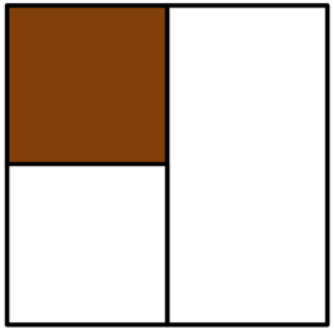
CONTEXT OF VIDEO

- An experienced teacher is interviewing a sixth grade student in a context in which there are many observers
- Interview is focused on assessing the student's:
  - Understanding of mathematical topics (fractions)
  - Skill with mathematical practices

What fraction of the rectangle below is shaded brown?_____



What fraction of the rectangle below is shaded brown?_____



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VIEWING FOCUS

- What aspects of the practice of **eliciting student thinking** can be seen and named? Are there others that are harder to see or to name?
- What aspects of **interpreting student thinking** can be seen and named? Are there some that are harder to see or to name?

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FOCUSING ON ELICITING AND INTERPRETING FROM THE OUTSET OF TEACHER EDUCATION

Early attention to eliciting and interpreting student 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

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② ASSESSING SKILLS WITH THE CORE PRACTICES OF ELICITING AND INTERPRETING CHILDREN'S MATHEMATICAL THINKING

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WHY TRY SIMULATIONS?

- **Standardization:** Appraises on-demand rather than at intern's discretion
- **Parity:** Makes possible fairness with respect to specific contextual aspects
- **Detail:** Enables specification of content, situation, teaching "problem" to ensure that important aspects of teaching are being assessed

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ASSESSING SKILLS OF ELICITING AND INTERPRETING STUDENT THINKING

CONTEXT

- **Focus**: Eliciting and interpreting student thinking with particular mathematics content
- **Timing:** Beginning of the program; before coursework focused on eliciting and interpreting student thinking

ASSESSMENT OVERVIEW

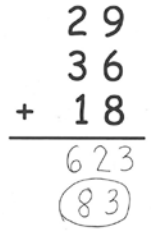
An intern:

- Interacts with a "standardized student" about a sample of student work
- Responds to a series of follow-up questions to surface the intern's
  - Interpretation of the student's thinking
  - Hypothesis about how the student would perform on a similar task

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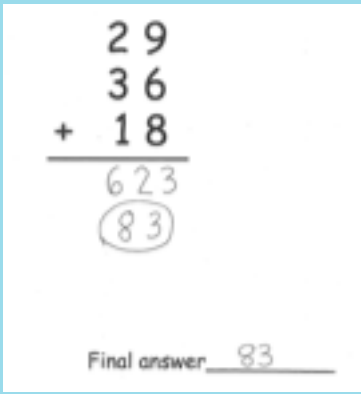
SETTING THE STAGE FOR ELICITING AND INTERPRETING



The teaching intern:

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.

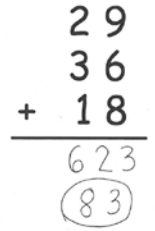


Correct answer, alternative algorithm, degree of understanding is unclear

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HOW IS EVIDENCE OF ELICITING SKILLS OBTAINED?



The teaching intern:

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

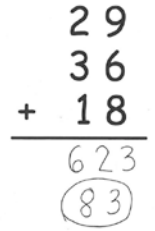
Developed response guidelines focused on:

- 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 teaching intern's skill with eliciting student thinking?

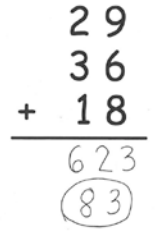
Evaluate whether the teaching intern:

- 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

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HOW IS EVIDENCE OF INTERPRETATION OBTAINED?

The teaching intern:

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
3. **responds to questions about her/ his interpretation of the student's thinking, including predicting the student's response on a similar task**

Questions

a) Briefly describe what was learned about the student's thinking

b) Identify a problem that could be used to help learn more about the student's method

c) Predict how the student would solve a similar problem:

$$\begin{array}{r} 27 \\ +\,48 \\ \hline \end{array}$$

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INTERPRETING STUDENT THINKING: VIEWING FOCUS

What can we notice about this teaching intern's skill with interpreting student thinking?

Evaluate whether the teaching intern:

- Accurately describes the student's method
- Accurately characterizes the student's understanding
- Accurately anticipates the student's response based on evidence from the interaction with the student

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③ SKILLS THAT TEACHING INTERNS BRING TO TEACHER EDUCATION



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INITIAL SKILL IN ELICITING STUDENT THINKING

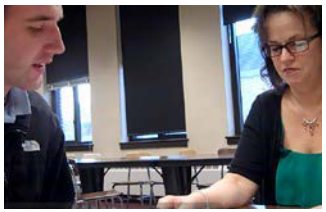
Context:

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

Analyzing the prevalence of eliciting moves:

- launching the interaction
- 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
- using tone and manner to maintain a productive environment

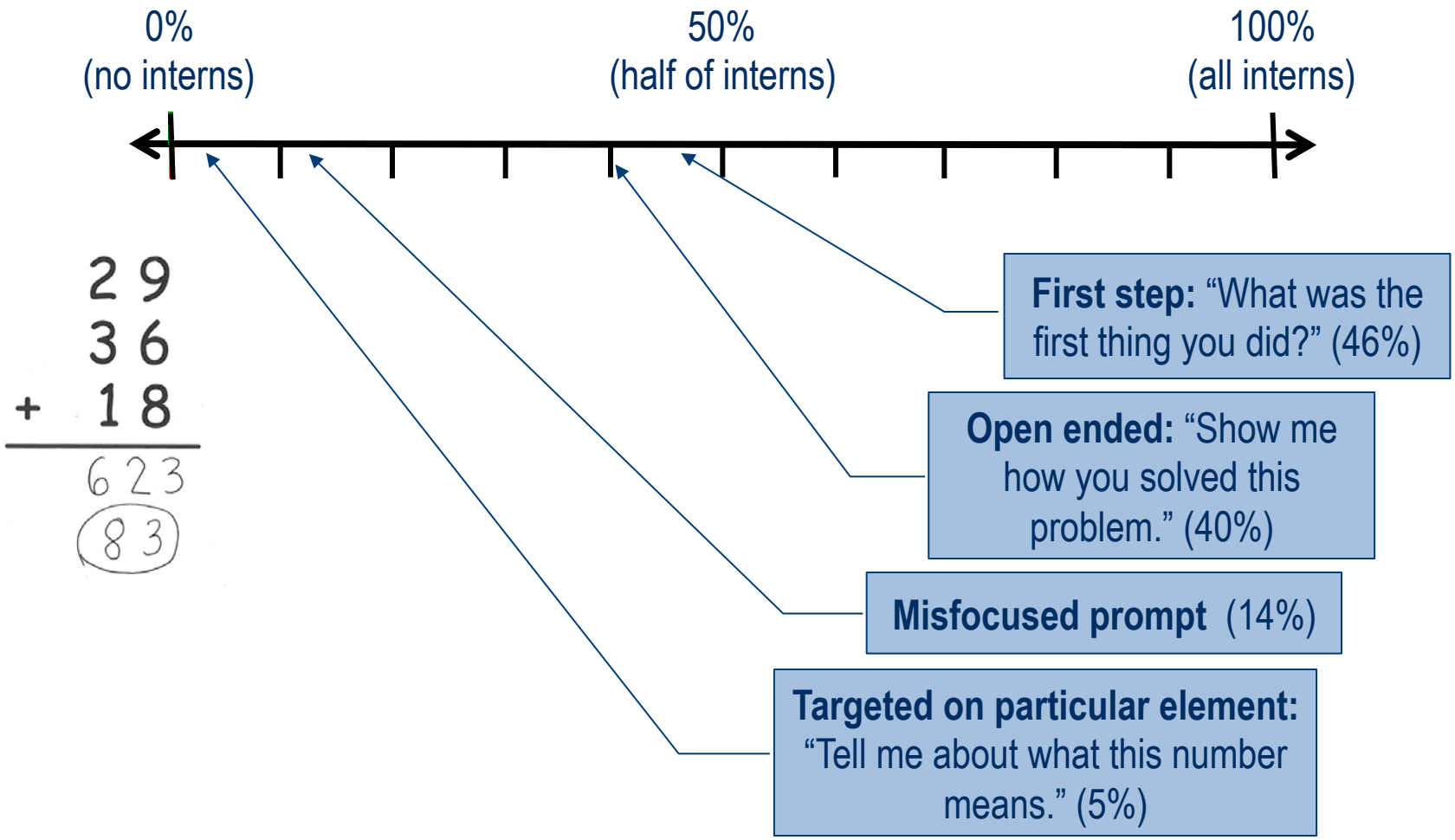




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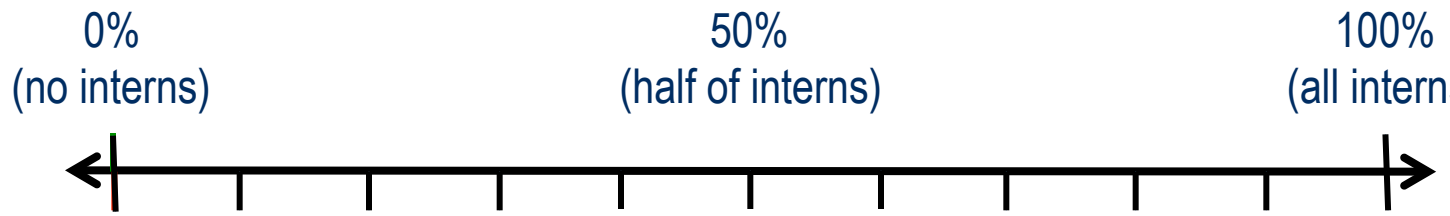
PREVALENCE OF ELICITING MOVES: LAUNCHING

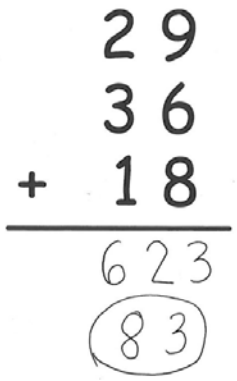


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PREVALENCE OF ELICITING MOVES: PROCESS AND/OR UNDERSTANDING





Eliciting description of trading

Fills in student thinking

Encourages writing to illustrate process

Eliciting the sequence of the process

Eliciting the process to determine ones

Poses purposeful follow-up problem

Probes understanding of the process

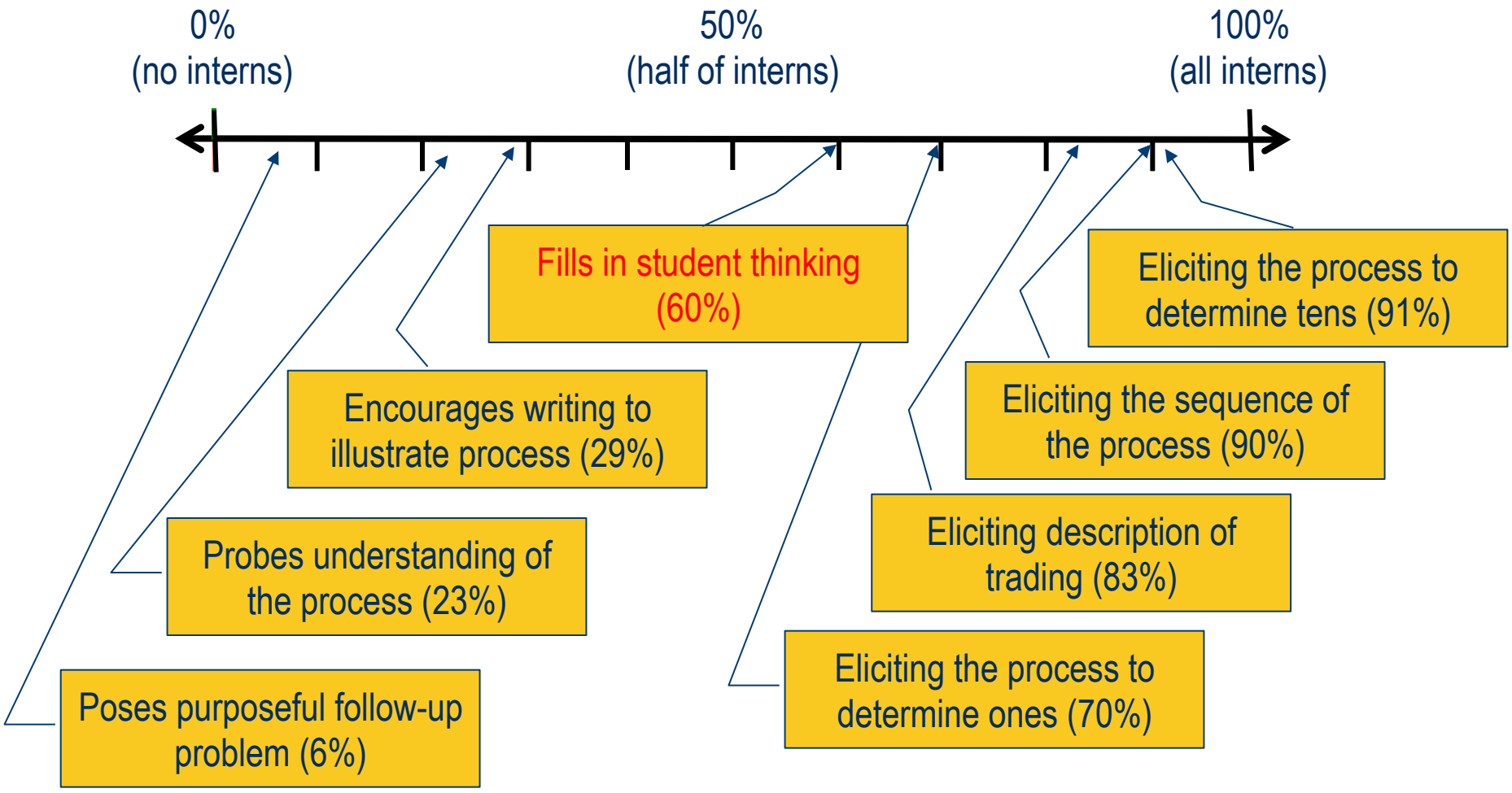
Eliciting the process to determine tens

- What do each of these eliciting moves sound like / look like?
- Which of the moves listed would you expect to see the most often/least often?

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PREVALENCE OF ELICITING MOVES: PROCESS AND/OR UNDERSTANDING



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INITIAL SKILL IN INTERPRETING STUDENT THINKING

Context: 2013 baseline simulation assessment (48 interns)

Analyzing interpretations:

- Accurately describes the student's method
  - Describes process student used (94%)
  - Connects to evidence from interview (94%)
- Accurately characterizes the student's understanding (50%)
- Accurately anticipates the student's response based on evidence from the interaction with the student
  - Uses student's process in a new problem (components from 98% - 91%)
  - Connects to evidence from interview (81% reproduced the L-R ordering with 8% not using that ordering even though they had elicited it)

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④ DISCUSSION

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WHICH PRACTICES ARE IMPORTANT TO ASSESS AT BASELINE?

- Explaining core content
- Posing questions about content
- Choosing and using examples of content
- Leading whole class discussions
- Setting up and managing small-group work
- Selecting & using specific methods to formatively assess students' learning
- Choosing, appraising, and modifying tasks, texts, and materials
- Analyzing teaching

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WHAT ARE WAYS TO LEARN ABOUT TEACHER CANDIDATES' ENTERING KNOWLEDGE AND SKILLS?

- Simulations
- Interviews
- Analysis of video or written cases
- Analysis of student work or curriculum materials
- Selected response assessments
- Others?

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