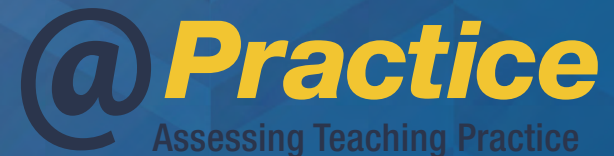


EXPLORING ALTERNATIVES FOR ASSESSING PRESERVICE TEACHERS' SKILL WITH ELICITING STUDENT THINKING

Timothy Boerst, Meghan Shaughnessy, Susanna Owens Farmer

American Association of Colleges for Teacher Education • Las Vegas, NV • February 25, 2016

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THE CHALLENGE

- Students, families, and schools need beginning teachers who are ready for entry-level classroom practice.
- Teacher education should focus more directly on **core practices of teaching** (e.g., Ball & Forzani, 2009; Grossman et al., 2009; Lampert & Graziani, 2009)
- The profession needs reliable ways to appraise teaching interns' skills and knowledge.

WHAT DO ASSESSMENTS OF TEACHING INTERNS' CAPABILITIES NEED TO BE LIKE?

- Assess entry-level practice: focus on skills and knowledge for the work of teaching
- Provide information about teaching interns' development and about instructional needs
- Be useful to teaching interns and program instructors, and also demonstrate professional accountability and rigor to external stakeholders
- Use time efficiently and resources wisely

PREVAILING APPROACHES TO ASSESSING TEACHING PRACTICE

- Field observations
- Video recordings of practice

But solely using these types of assessments is challenging...

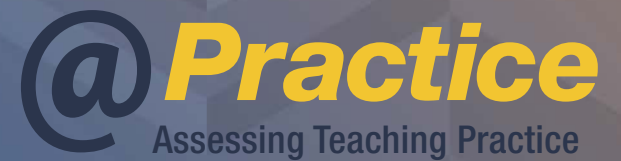
AN ARGUMENT FOR COMPLEMENTARY ASSESSMENTS

- Teaching is influenced by context
- Contextual factors impact teaching interns' ability to demonstrate their skills in the context of practice
 - **Field-based assessments** enable us to see how teaching interns meet the unique demands of a particular teaching situation
 - **Simulation assessments** hold promise because they can address the variability in what can be assessed in field-based work

A FIELD-BASED ASSESSMENT



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ELICITING STUDENT THINKING

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

- Launching an interaction with a student
- Asking follow-up questions to learn about a student's
 - Process for solving a mathematics problem
 - Understanding of mathematical ideas involved in a problem
- Being responsive to students by
 - Attending to and taking up student ideas
 - Maintaining a tone and manner that encourages the student to share his or her thinking

FIELD-BASED ASSESSMENT

- Teaching interns
 - Interview an elementary school student in his or her field placement
 - Submit a video of the interview
- Instructors view a portion of the interview to assess interns' skill with eliciting student thinking
- Sample task:

Circle the bigger fraction: $\frac{1}{4}$ or $\frac{1}{6}$

Scoring Tool Criteria

Launches interaction with a question that is neutral, open, and focused on student thinking

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- Asks specific questions about what the student did
- Attends to and takes up specific ideas that the student talks about

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Attends to the student's ideas in follow-up questions

- Asks specific questions about what the student did
- Attends to and takes up specific ideas that the student talks about

Uses appropriate tone and manner

- Refrains from directing the student to a different process
- Refrains from making evaluative comments
- Prompts the student fluently

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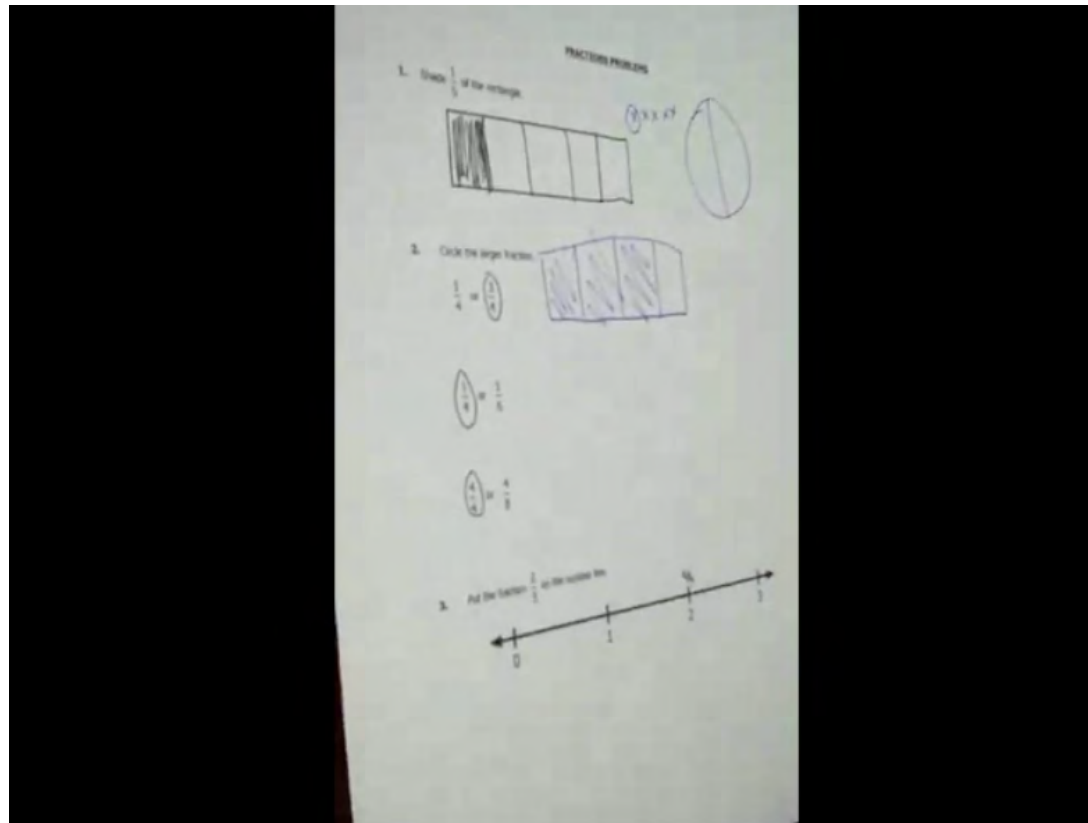
Uses appropriate tone and manner

- Refrains from directing the student to a different process
- Refrains from making evaluative comments
- Prompts the student fluently

Uses appropriate mathematical language and representations

FIELD-BASED ASSESSMENT: INTERN #1

Task: Circle the bigger fraction: $\frac{1}{4}$ or $\frac{1}{6}$

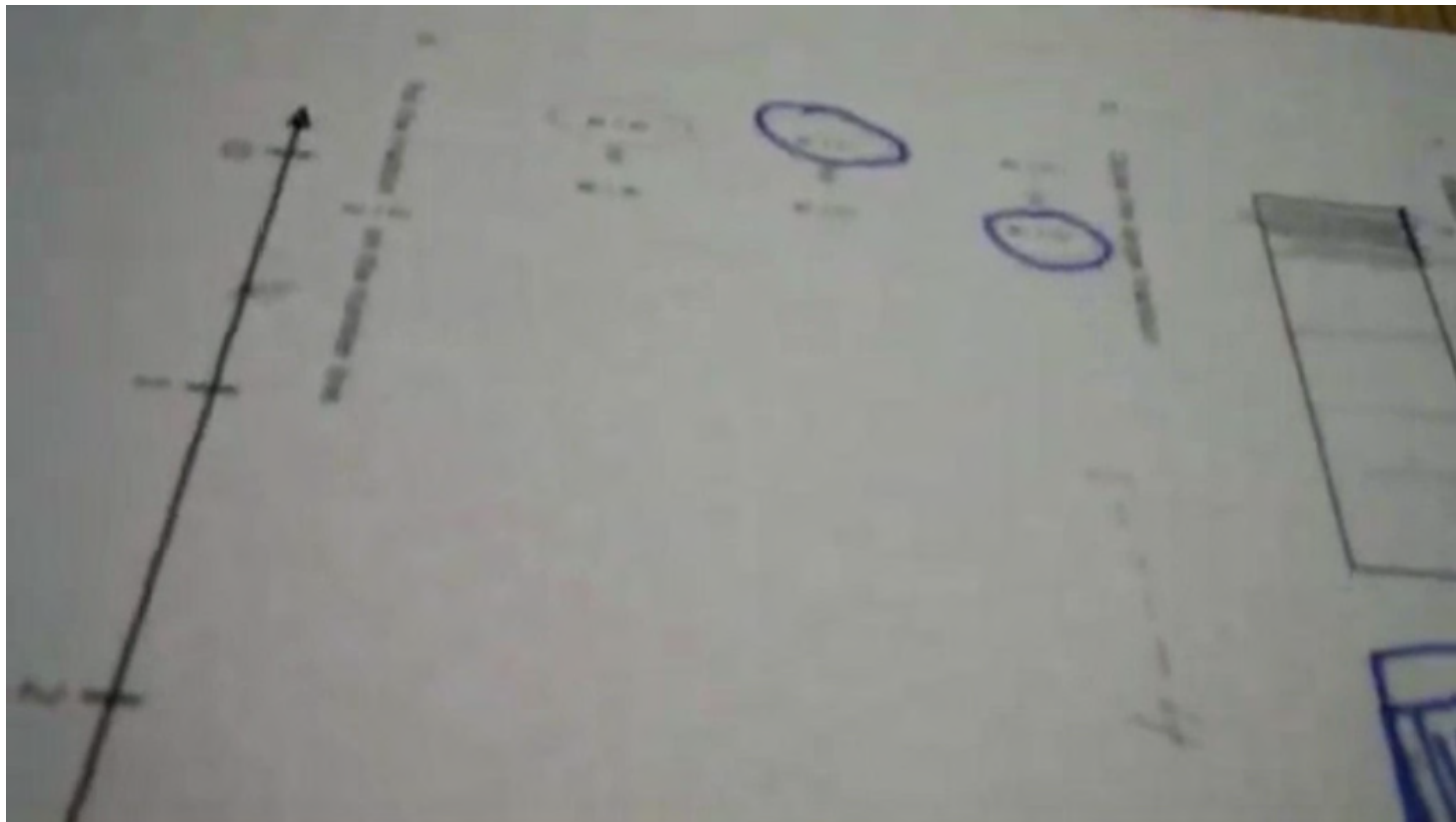


POSSIBLE OBSERVATIONS: INTERN #1

Scoring Criteria	Evidence
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes
Elicits the specific steps of the student's process	Yes
Probes the student's understanding of the steps	Yes
Attends to the student's ideas in follow-up questions	Yes
Uses appropriate tone and manner	Yes
Uses appropriate mathematical language and representations	Yes

FIELD-BASED ASSESSMENT: INTERN #2

Task: Circle the bigger fraction: $\frac{1}{4}$ or $\frac{1}{6}$

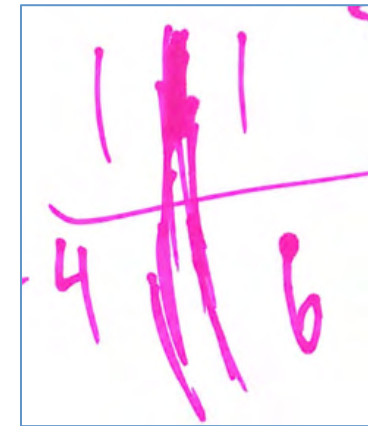
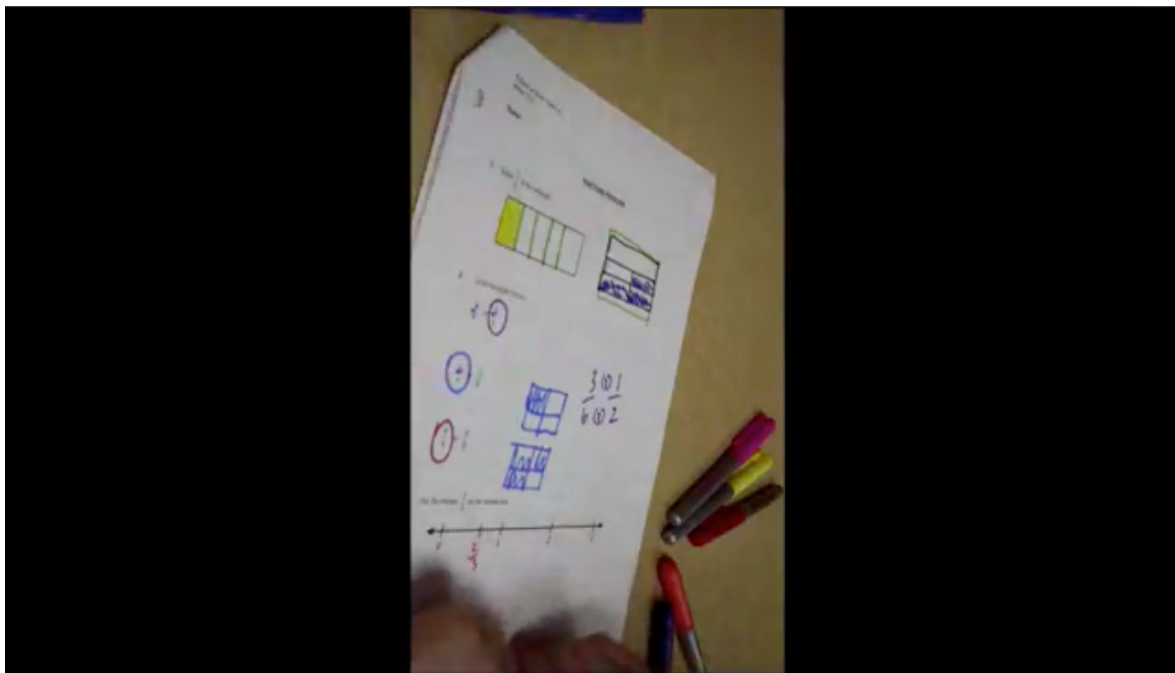


POSSIBLE OBSERVATIONS: INTERN #2

Scoring Criteria	Evidence
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes
Elicits the specific steps of the student's process	Yes
Probes the student's understanding of the steps	Yes
Attends to the student's ideas in follow-up questions	Yes
Uses appropriate tone and manner	Yes
Uses appropriate mathematical language and representations	Yes

FIELD-BASED ASSESSMENT: INTERN #3

Task: Circle the bigger fraction: $\frac{1}{4}$ or $\frac{1}{6}$



POSSIBLE OBSERVATIONS: INTERN #3

Scoring Criteria	Evidence
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes
Elicits the specific steps of the student's process	NA
Probes the student's understanding of the steps	NA
Attends to the student's ideas in follow-up questions	NA
Uses appropriate tone and manner	Yes
Uses appropriate mathematical language and representations	NA

SUMMARY OF THE THREE CASES

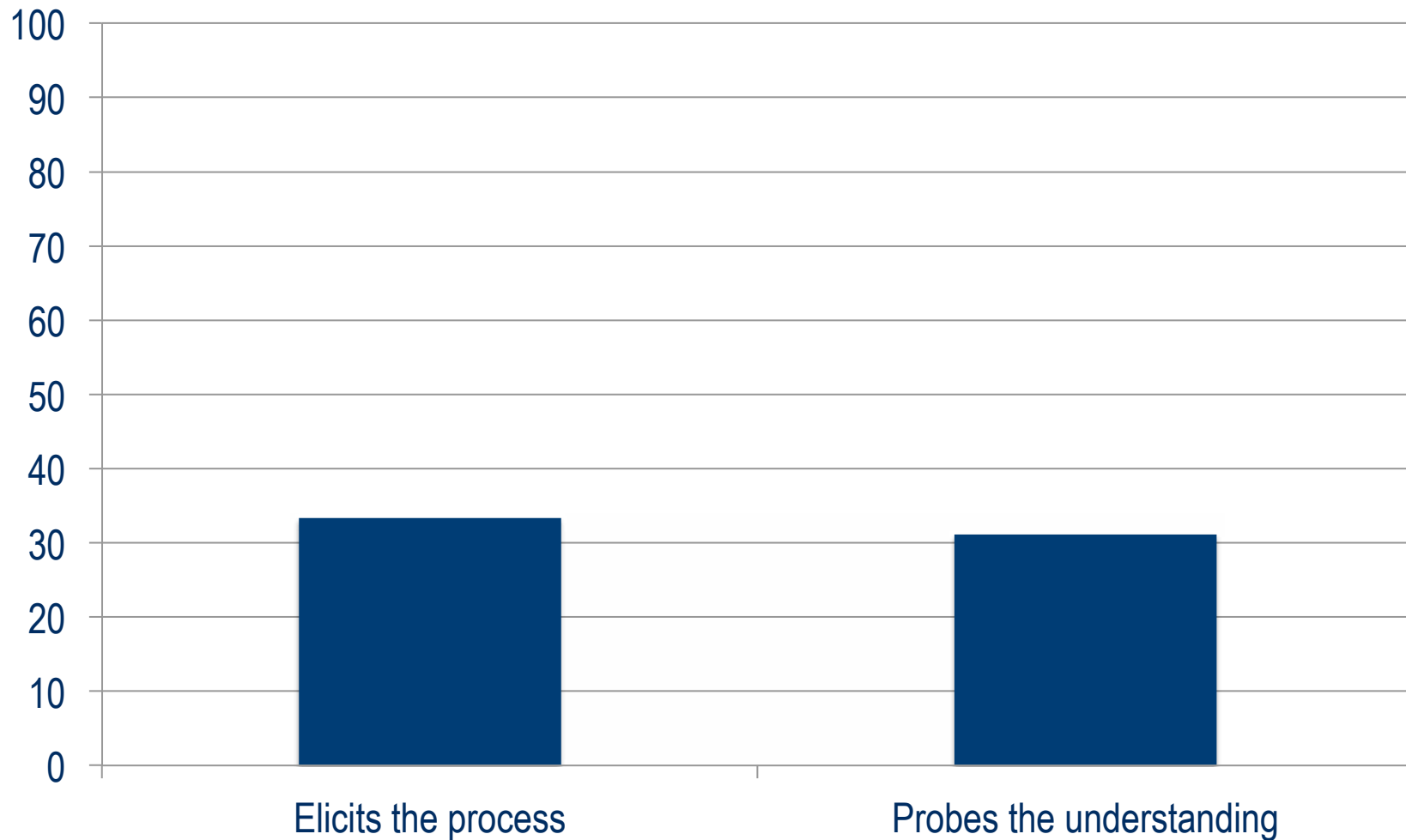
- **Intern #1:** The student used a standard approach (common numerator) and the intern asked a series of questions to understand the student's thinking
- **Intern #2:** The student was using an invented approach and the intern had to ask a series of pointed questions to understand the student's thinking
- **Intern #3:** The student largely shared her thinking in response to one question posed by the intern

WHAT DO CHILDREN DO?

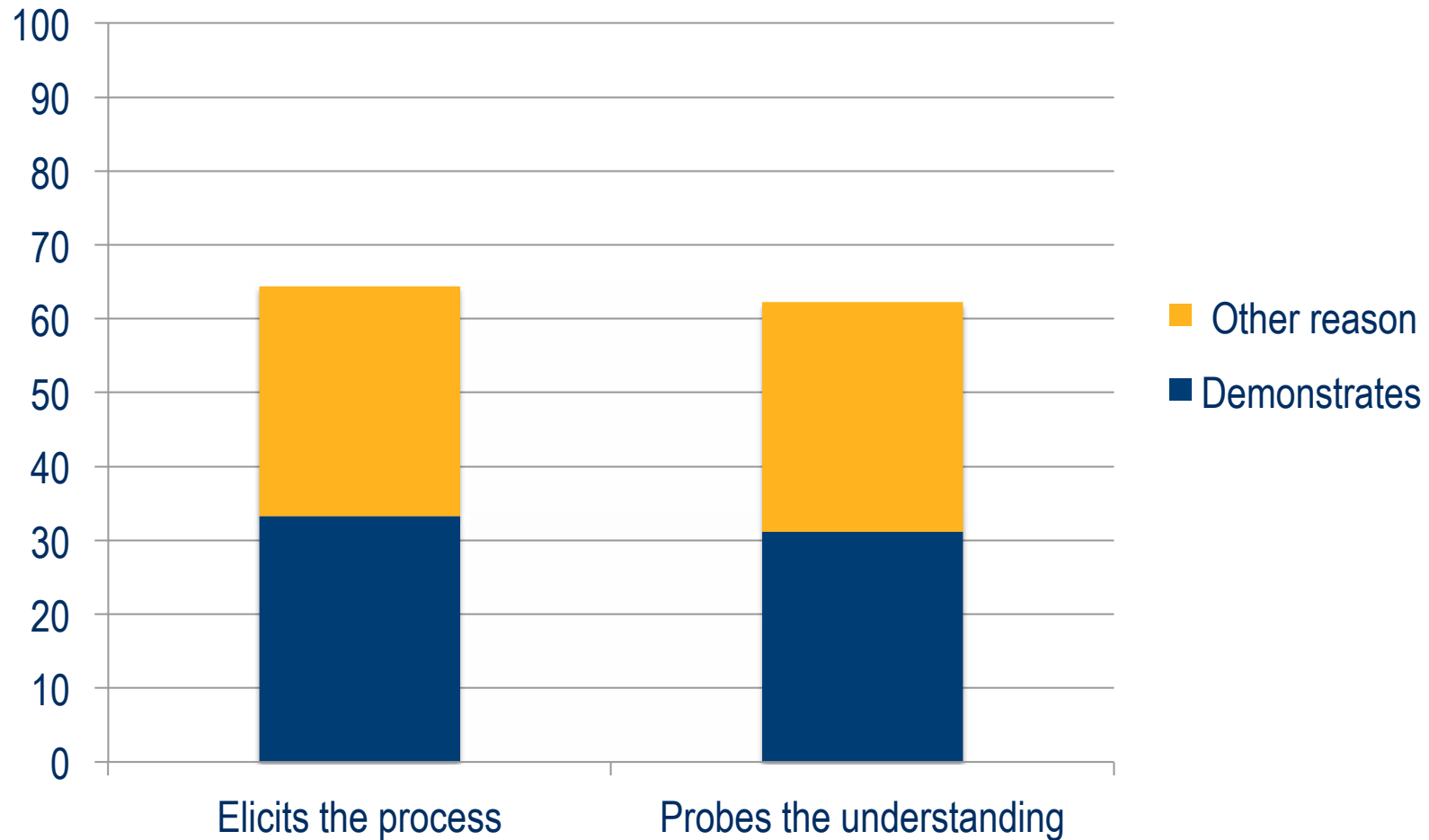
We examined records from 45 field-based interviews, with particular focus on one task.

- Many students had correct answers (91%)
- Students used different strategies
- A small number of students changed their thinking:
 - One student changed his/her answer
 - Three students demonstrated a different process
- Some students gave their full process in response to one question (36%)
- Some students gave their full reasoning in response to one question (31%)
- More than half of the students wrote spontaneously (60%)

PREVALENCE OF TEACHING MOVES



EXAMINING THE PREVALENCE OF TEACHING MOVES FROM A DIFFERENT ANGLE



FIELD-BASED ASSESSMENTS

Affordances

- Teaching interns and students may have shared understandings that influence the interaction
- Teaching interns can show how well they are able to tailor their teaching to a particular situation
- The assessment situation feels authentic to the teaching intern
- Teaching interns learn about patterns of student thinking (across experiences of interns in a course)

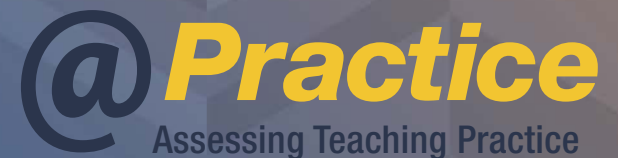
Challenges

- Teaching interns and students may have shared understandings that influence the interaction
- Teacher educators have limited insight into the actual thinking of the student
- Teacher educators cannot control the processes students use or the understandings they have
- Contexts may not provide opportunities for interns to demonstrate the skill being assessed
- Variation in assessment contexts makes it difficult to notice patterns across a whole group of teaching interns

SIMULATIONS FOR ASSESSING SKILL WITH ELICITING STUDENT THINKING



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SIMULATION ASSESSMENTS

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

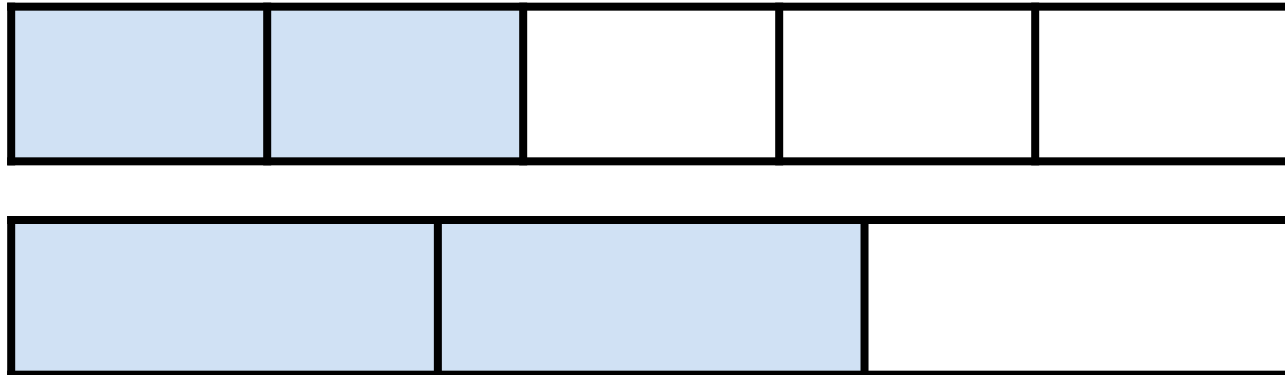
- Used in other professional fields (e.g., medicine, nursing, dentistry) as well as in most skilled occupations where skill, knowledge, judgment, and client safety are concerns
- Enable common appraisal of interns' knowledge and skill in ways that control for many sources of variability that complicate assessment of practice

FEATURES TO CONSIDER WHEN DESIGNING SIMULATIONS

- Particular content topic
- Correctness of the solution (correct, incorrect)
- Type of process being used (standard, invented, alternative)
- Degree to which the student understands the process
- Developmental/grade level of student
- The student's "way of being"

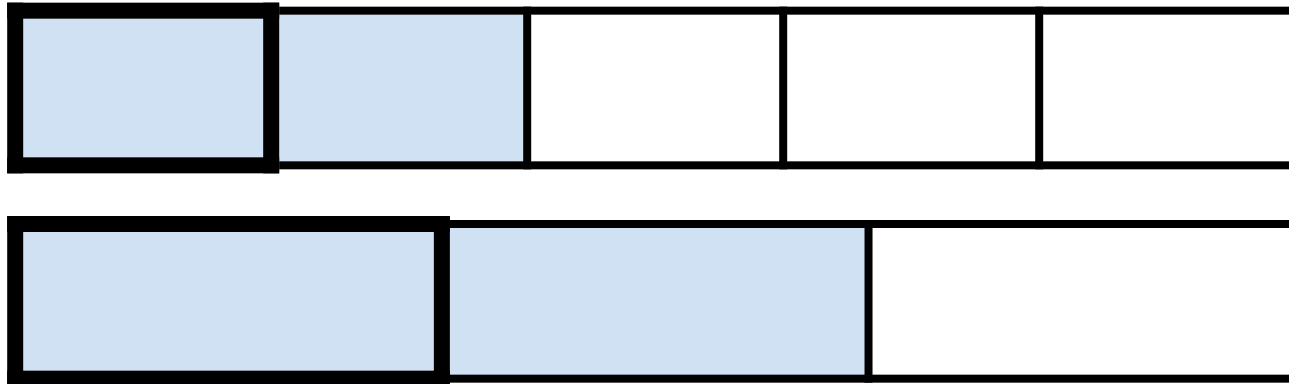
COMMON NUMERATOR METHOD FOR COMPARING FRACTIONS

$\frac{2}{5}$ and $\frac{2}{3}$



COMMON NUMERATOR METHOD FOR COMPARING FRACTIONS

$\frac{2}{5}$ and $\frac{2}{3}$



SETTING THE STAGE FOR ELICITING

The teaching intern:

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

Mathematics task presented to the student:

Which fraction is greater:
 $\frac{3}{7}$ or $\frac{2}{5}$

Student work:

$$\begin{aligned} \frac{3}{7} &= \frac{6}{14} & \frac{2}{5} &= \frac{6}{15} \\ \frac{6}{14} &< \frac{6}{15} \\ \text{so: } \frac{3}{7} &< \frac{2}{5} \end{aligned}$$

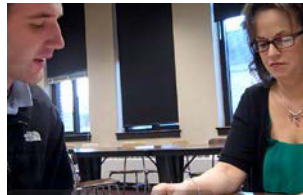
Your goal is to elicit and probe to find out what the “student” did to produce the answer as well as the way in which the student understands the steps that were performed.

Incorrect answer, alternative algorithm, degree of understanding is unclear

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 a common numerator approach to compare fractions
 - Once has common numerators, always chooses the fraction with the larger denominator as the greater fraction
- General orientations towards responses such as
 - Don't make errors representing fractions
 - Give the least amount of information that is still responsive to the question
- Responses to anticipated questions

$$\frac{3}{7} = \frac{6}{14} \quad \frac{2}{5} = \frac{6}{15}$$
$$\frac{6}{14} < \frac{6}{15}$$
$$\text{so: } \frac{3}{7} < \frac{2}{5}$$

ELICITING A STUDENT'S THINKING



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

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

$$\text{So: } \frac{3}{7} < \frac{2}{5}$$

POSSIBLE OBSERVATIONS: INTERN #3

Scoring Criteria	Simulation
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes
Elicits the specific steps of the student's process	Yes
Probes the student's understanding of the steps	To some extent
Attends to the student's ideas in follow-up questions	Yes
Uses appropriate tone and manner	Yes
Uses appropriate mathematical language and representations	Yes

POSSIBLE OBSERVATIONS: INTERN #3

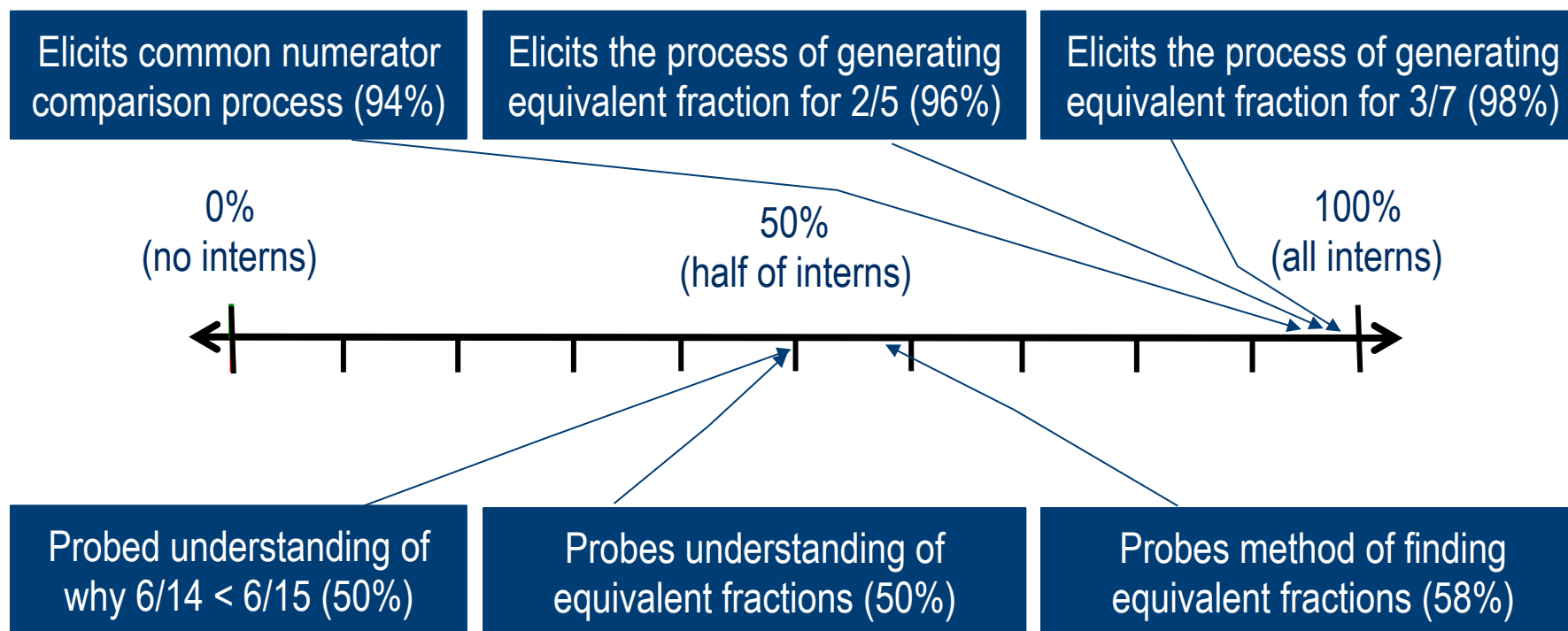
Scoring Criteria	Simulation	Field
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes	Yes
Elicits the specific steps of the student's process	Yes	NA
Probes the student's understanding of the steps	To some extent	NA
Attends to the student's ideas in follow-up questions	Yes	NA
Uses appropriate tone and manner	Yes	Yes
Uses appropriate mathematical language and representations	Yes	NA

POSSIBLE OBSERVATIONS: INTERN #3

Scoring Criteria	Simulation	Field
Launches interaction with a question that is neutral, open, and focused on student thinking	Yes	Yes
Elicits the specific steps of the student's process	Yes	NA
Probes the student's understanding of the steps	To some extent	NA
Attends to the student's ideas in follow-up questions	Yes	NA
Uses appropriate tone	Yes	Yes
Uses appropriate methods	Yes	NA

Confirmation of skills and expansion of what can be assessed

PREVALENCE OF ELICITING MOVES



96% probed understanding of at least one component

STANDARDIZED SIMULATION ASSESSMENTS

Affordances

- All teaching interns have the same level of familiarity with the “student”
- All interns have the same opportunity to fully demonstrate the practice
- The standardized student’s thinking and ways of being can be tailored and are known to the assessor
- Assessment is efficient and not dependent on elementary school schedule
- Standardization facilitates the opportunity to compare performance across a group of interns

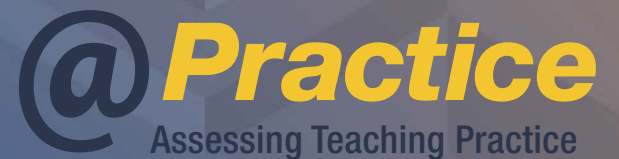
Challenges

- Teaching interns are not able to capitalize on shared understandings that would normally influence the interaction
- Elements of the assessment situation feel artificial
- Teaching interns are only exposed to one pattern of thinking

COMPLEMENTARY ASSESSMENTS



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THE NEED FOR COMPLEMENTARY ASSESSMENTS

While field-based assessments...

- Allow teaching interns to show that they can elicit student thinking in contextually sensitive ways

The unique demands of the field often mean that...

- Assessors are not able to see the complete practice of all teaching interns
- Issues of fairness and interpretation arise

Using simulations as complementary assessments...

- Often provide fuller access to the core components of the practice
- Provide confirming information

COORDINATING FIELD AND SIMULATION ASSESSMENTS

To coordinate field assessments and simulations:

- Some assessment components must be held constant:
 - Scoring tools must focus on the same areas of work
 - Content must be similar (e.g., comparing fractions)
 - The student thinking should be in a similar grade range
 - Set up for the eliciting work must be similar (e.g., similar tasks, having kids solve the problems first in both cases)
- Other assessment components can vary depending on how the data is being used (e.g., timing of the assessments)