ASSESSING TEACHING PRACTICE: NEW WAYS OF THINKING ABOUT WHY, WHEN, AND HOW

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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)
- Teacher educators would benefit from knowing more about 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 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

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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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PROGRAM LEVEL ASSESSMENT

UM's redesigned Elementary Undergraduate Teacher Education Program includes program level assessment:

- Focus on high leverage teaching practices, content knowledge for teaching, and professional ethical obligations
- Serve multiple purposes
- Involve and inform core stakeholders
- Infused into the program at multiple points in time
  - Beginning, midpoint, and conclusion of the program
  - Within courses and in designated assessment windows

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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

- 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

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FOCUSING ON ELICITING AND INTERPRETING 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

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USING STANDARDIZED SIMULATIONS TO ASSESS ELICITING AND INTERPRETING

- **Efficient:** Standardization allows for the assessment of many teaching candidates in a compressed timeframe
- **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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① ASSESSING SKILLS WITH THE CORE PRACTICES OF ELICITING AND INTERPRETING CHILDREN'S MATHEMATICAL THINKING

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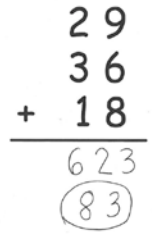
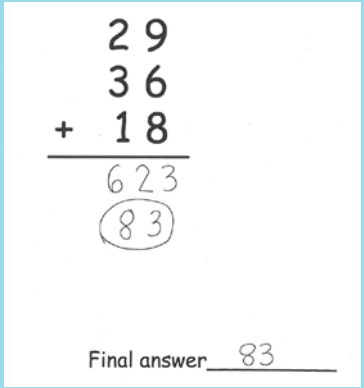
SETTING THE STAGE FOR ELICITING



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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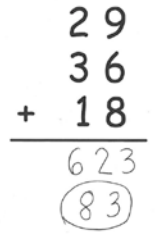
HOW IS EVIDENCE OF ELICITING SKILLS OBTAINED?



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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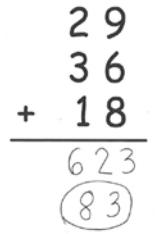
ELICITING STUDENT THINKING: VIEWING FOCUS



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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② SKILLS OF TEACHING INTERNS UPON ENTRY TO THE PROGRAM

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INITIAL SKILL IN ELICITING STUDENT THINKING

Context:

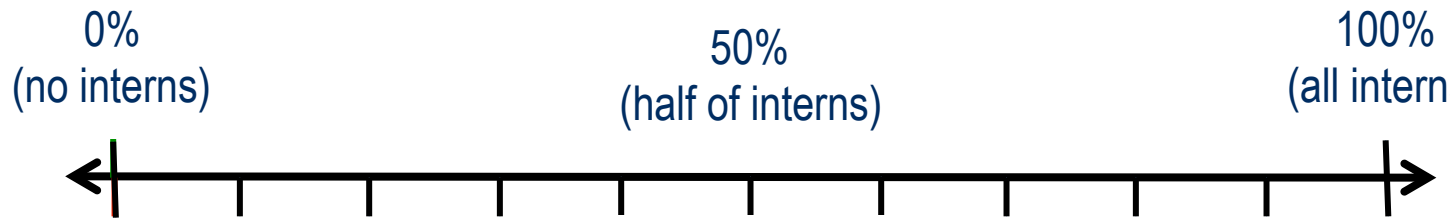
- 2013 baseline simulation assessment (48 interns)
- Data collected during the first week of the TE program

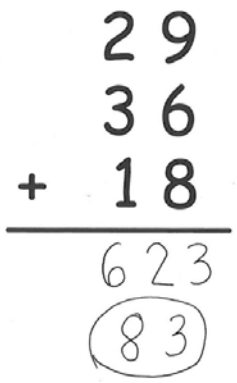
Analyzing the prevalence of eliciting moves:

- 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



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 why regrouping is needed	Probes meaning of the regrouping	Eliciting the process to determine tens

Which of the moves listed would you expect to see the most often/least often at the beginning of a teacher education program?

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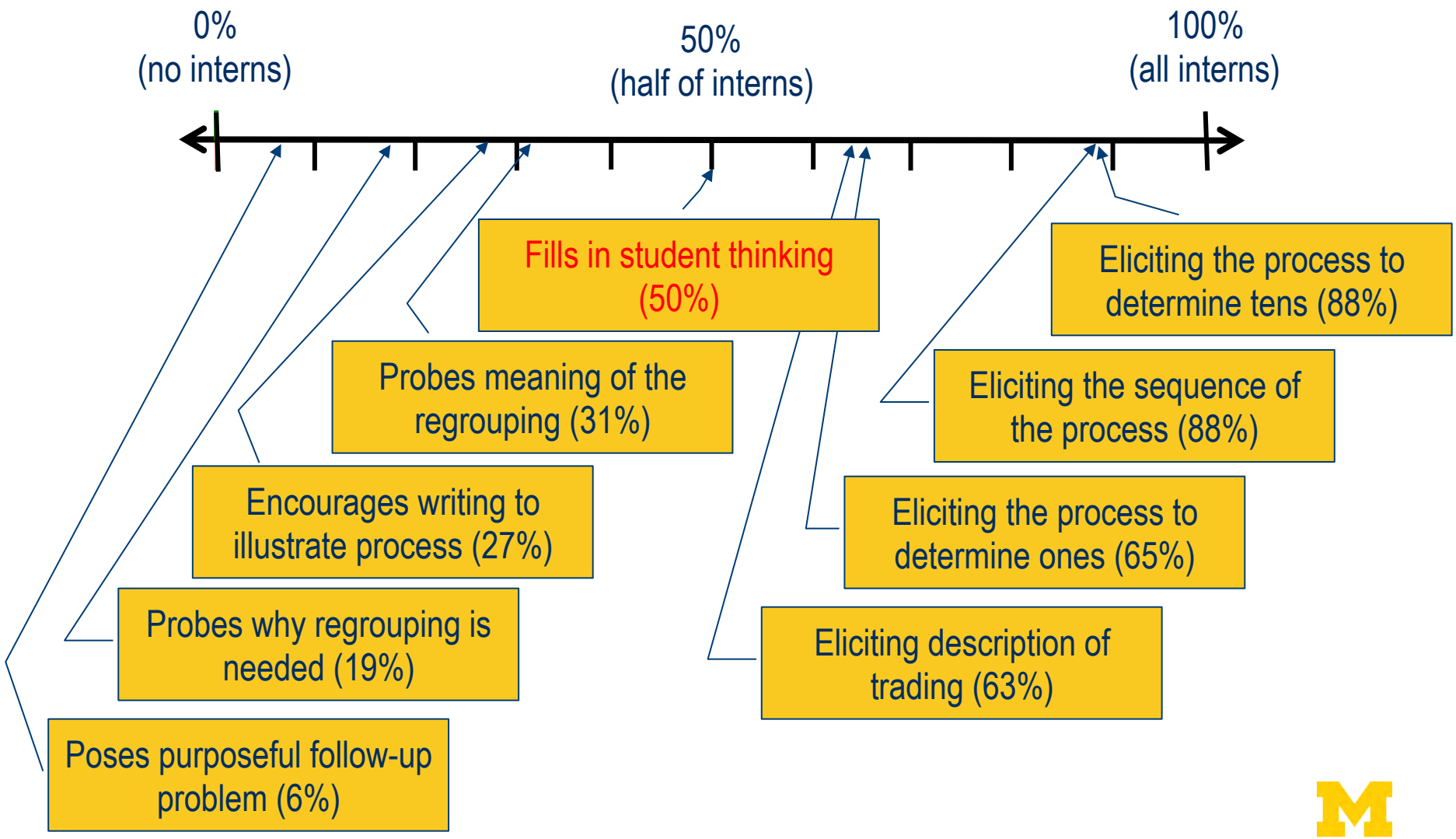
PREVALENCE OF MOVES: POSING A FOLLOW-UP PROBLEM



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③ MAKING USE OF INFORMATION ABOUT SKILLS AND CAPABILITIES THAT INTERNS BRING

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DISCUSSION

- For what purposes might information about the knowledge and skills that beginners bring to teacher education be used?

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POSSIBLE PURPOSES

- Recruitment
- Curriculum, including settings and other needed resources
- Identification of teaching interns in need of particular supports
- Program effectiveness

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THREE CHALLENGES

Posing questions that enable a student to share his/her thinking

Considering processes/approaches that differ from one's own and carefully evaluating them

Unpacking the mathematics

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AN EXAMPE: CHILDREN AS SENSE-MAKERS

- Nine-week course focused on developing the following practices:
  - Eliciting and interpreting children's mathematical thinking
  - Explaining mathematical content, with a focus on fractions
  - Using assessment information to inform instruction
- Course is in the 2nd semester of the 4-semester undergraduate elementary program
- Includes work in a 5th grade classroom and in interns' field placements (3rd – 5th grade classrooms)

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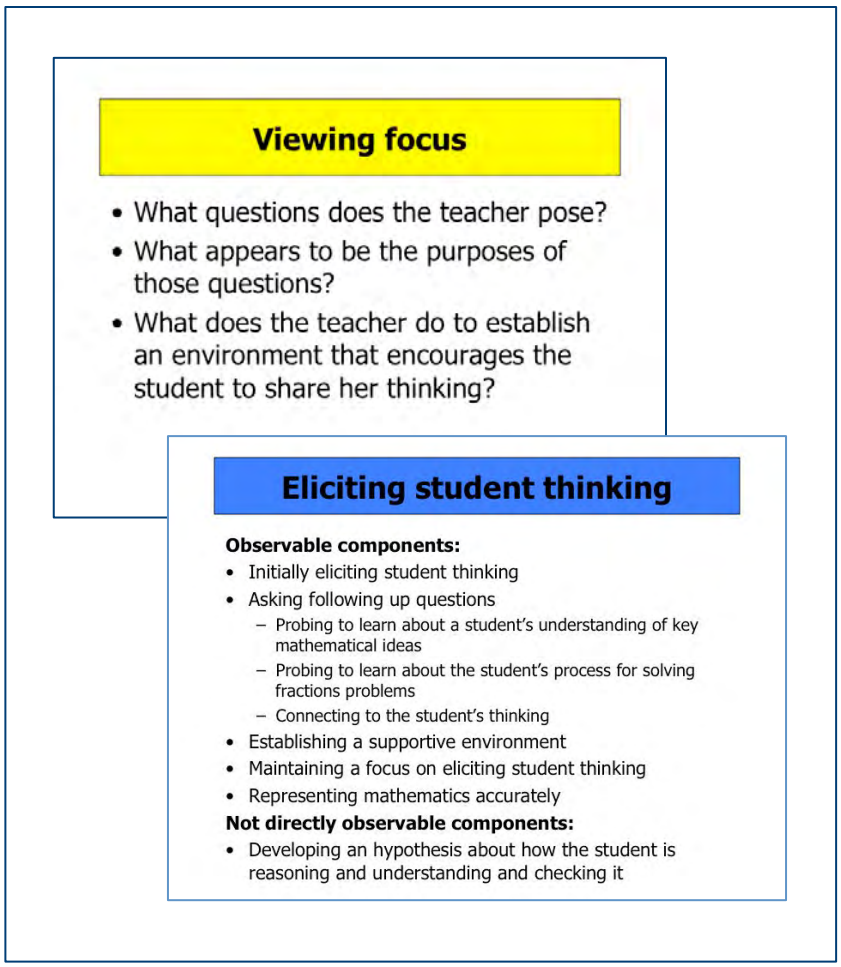
SEQUENCE OF WORK ON ELICITING

Teaching interns:

1. **Unpack the work of eliciting**



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SEQUENCE OF WORK ON ELICITING

Teaching interns:

1. Unpack the work of eliciting
2. **Assignment #1: Interview a student in field placement**

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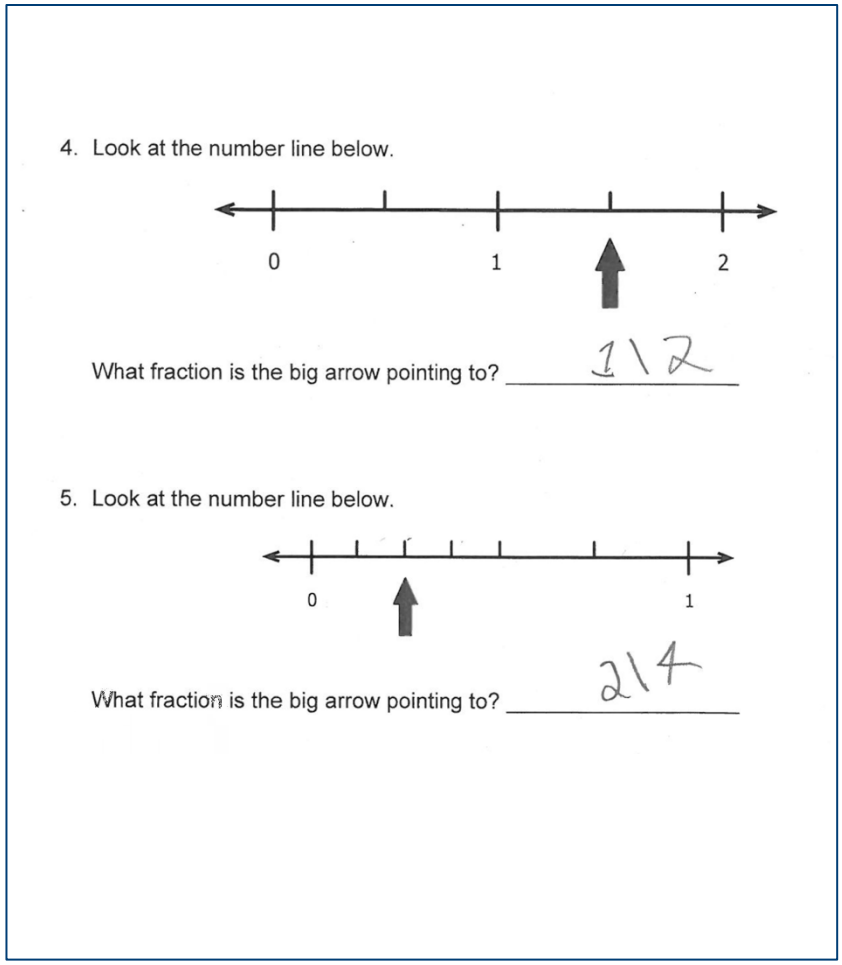
SEQUENCE OF WORK ON ELICITING

Teaching interns:

1. Unpack the work of eliciting
2. Assignment #1: Interview a student in field placement
3. **Assignment #2: Interview a fifth grade student about work on a fractions quiz**


4. Look at the number line below.

What fraction is the big arrow pointing to? 1 1/2

5. Look at the number line below.

What fraction is the big arrow pointing to? 2/4

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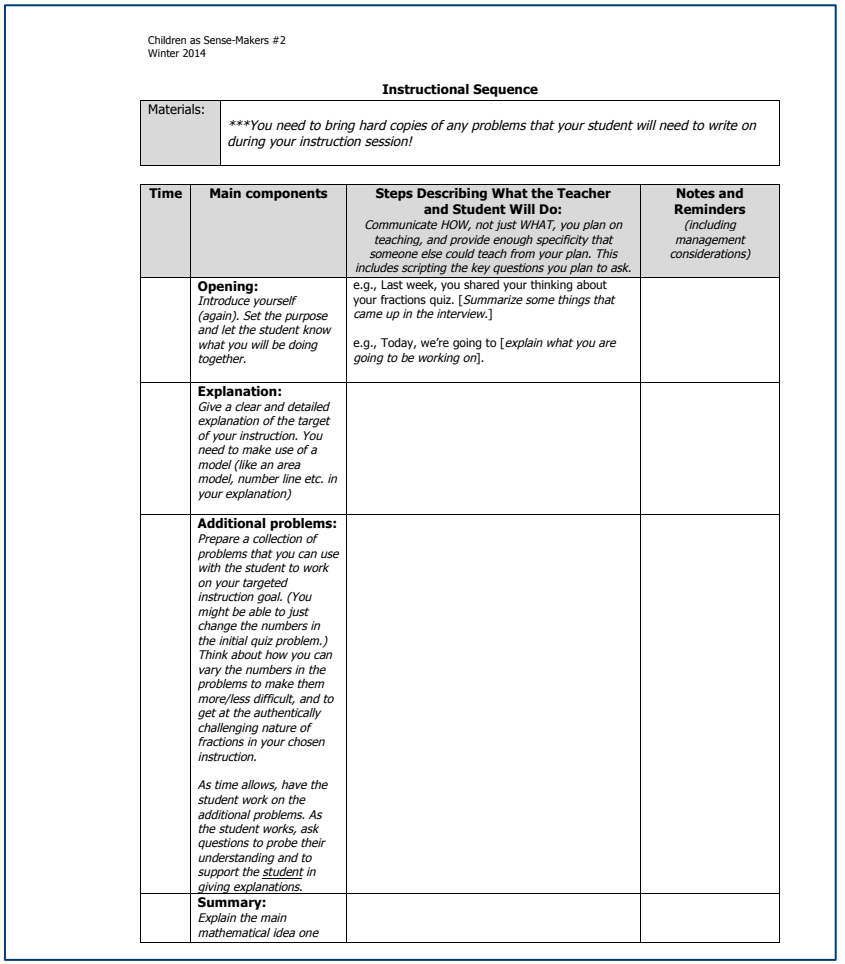
SEQUENCE OF WORK ON ELICITING

Teaching interns:

1. Unpack the work of eliciting
2. Assignment #1: Interview a student in field placement
3. Assignment #2: Interview a fifth grade student about work on a fractions quiz
4. **Assignment #3: Targeted instruction session**



Children as Sense-Makers #2
Winter 2014

Instructional Sequence

Materials:	****You need to bring hard copies of any problems that your student will need to write on during your instruction session!*

Time	Main components	Steps Describing What the Teacher and Student Will Do: *Communicate HOW, not just WHAT, you plan on teaching, and provide enough specificity that someone else could teach from your plan. This includes scripting the key questions you plan to ask.*	Notes and Reminders *(including management considerations)*
	Opening: *Introduce yourself (again). Set the purpose and let the student know what you will be doing together.*	e.g., Last week, you shared your thinking about your fractions quiz. [*Summarize some things that came up in the interview.*] e.g., Today, we're going to [*explain what you are going to be working on*].	
	Explanation: *Give a clear and detailed explanation of the target of your instruction. You need to make use of a model (like an area model, number line etc. in your explanation)*		
	Additional problems: *Prepare a collection of problems that you can use with the student to work on your targeted instruction goal. (You might be able to just change the numbers in the initial quiz problem.) Think about how you can vary the numbers in the problems to make them more/less difficult, and to get at the authentically challenging nature of fractions in your chosen instruction.* *As time allows, have the student work on the additional problems. As the student works, ask questions to probe their understanding and to support the student in giving explanations.*		
	Summary: *Explain the main mathematical idea one*		

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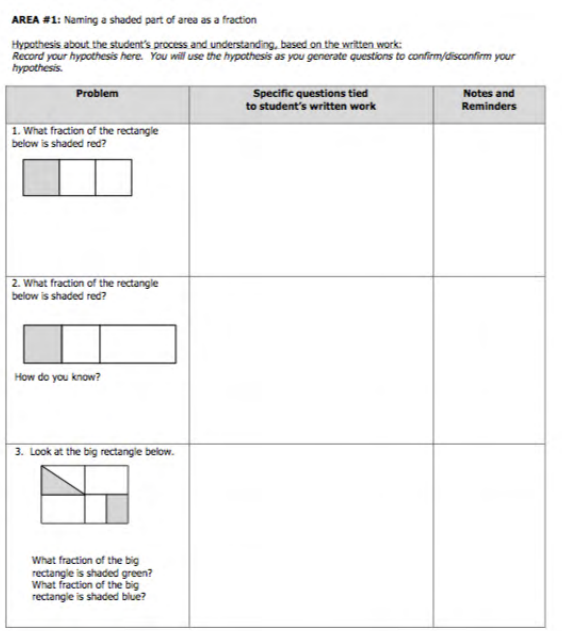
INTERNS' WORK ON ELICITING IN THE CONTEXT OF INTERVIEW ASSIGNMENTS

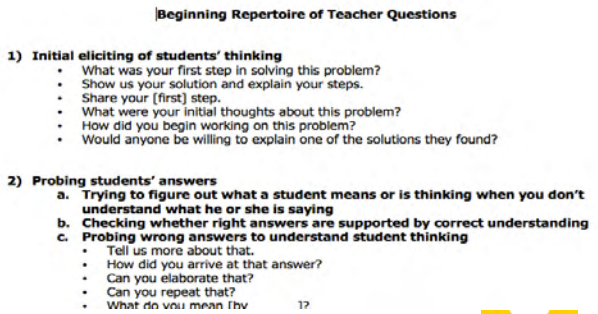
Prepare to elicit a student's thinking



AREA #1: Naming a shaded part of area as a fraction

Hypothesis about the student's process and understanding, based on the written work:
Record your hypothesis here. You will use the hypothesis as you generate questions to confirm/disconfirm your hypothesis.

Problem	Specific questions tied to student's written work	Notes and Reminders
1. What fraction of the rectangle below is shaded red?		
2. What fraction of the rectangle below is shaded red? How do you know?		
3. Look at the big rectangle below. What fraction of the big rectangle is shaded green? What fraction of the big rectangle is shaded blue?		



Beginning Repertoire of Teacher Questions

1) Initial eliciting of students' thinking
- What was your first step in solving this problem?
- Show us your solution and explain your steps.
- Share your [first] step.
- What were your initial thoughts about this problem?
- How did you begin working on this problem?
- Would anyone be willing to explain one of the solutions they found?

2) Probing students' answers
- **a. Trying to figure out what a student means or is thinking when you don't understand what he or she is saying**
- **b. Checking whether right answers are supported by correct understanding**
- **c. Probing wrong answers to understand student thinking**
  - Tell us more about that.
  - How did you arrive at that answer?
  - Can you elaborate that?
  - Can you repeat that?
  - What do you mean [by]?

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INTERNS' WORK ON ELICITING IN THE CONTEXT OF INTERVIEW ASSIGNMENTS

Prepare to elicit a student's thinking

Enact the practice of eliciting in the field

AREA #1: Naming a shaded part of area as a fraction

Hypothesis about the student's process and understanding, based on the written work:
Record your hypothesis here. You will use the hypothesis as you generate questions to confirm/disconfirm your hypothesis.

Problem	Specific questions tied to student's written work	Notes and Reminders
t fraction of the rectangle shaded red?		
2. What fraction of the rectangle below is shaded red?		

Beginning Repertoire of Teacher Questions

1) **Initial eliciting of students' thinking**
   - What was your first step in solving this problem?
   - Show us your solution and explain your steps.
   - Share your [first] step.
   - What were your initial thoughts about this problem?
   - How did you begin working on this problem?
   - Would anyone be willing to explain one of the solutions they found?

2) **Probing students' answers**
   a. **Trying to figure out what a student means or is thinking when you don't understand what he or she is saying**
   b. **Checking whether right answers are supported by correct understanding**
   c. **Probing wrong answers to understand student thinking**
      - Tell us more about that.
      - How did you arrive at that answer?
      - Can you elaborate that?
      - Can you repeat that?
      - What do you mean [by]?

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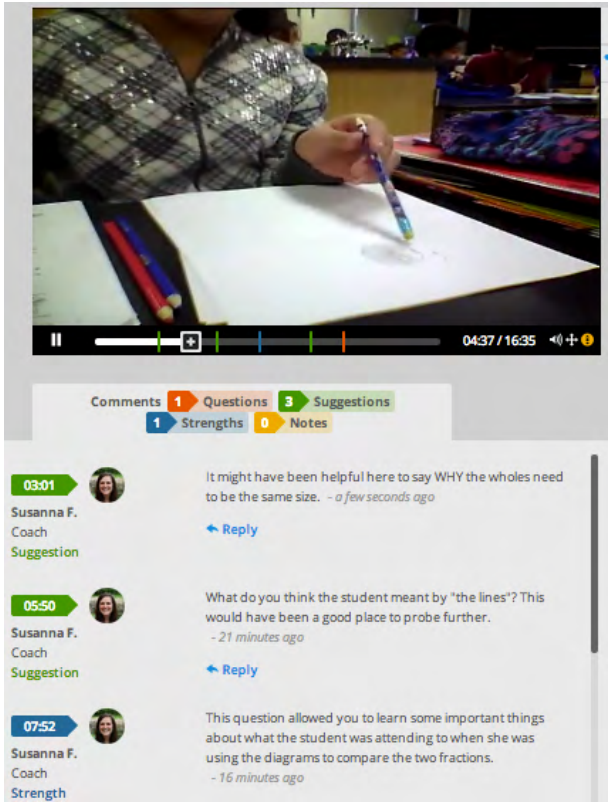
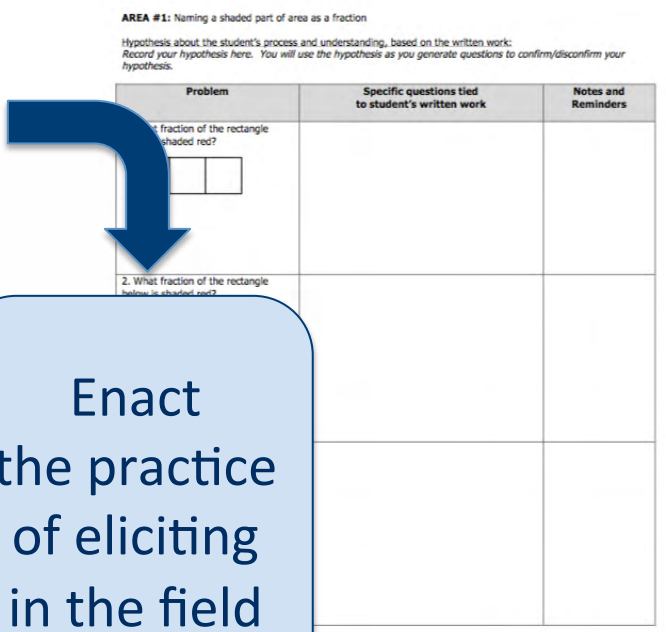
INTERNS' WORK ON ELICITING IN THE CONTEXT OF INTERVIEW ASSIGNMENTS

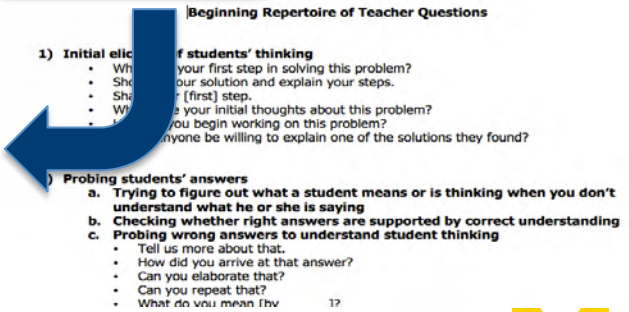


Prepare to elicit a student's thinking

Enact the practice of eliciting in the field

Analyze the video record of the enactment





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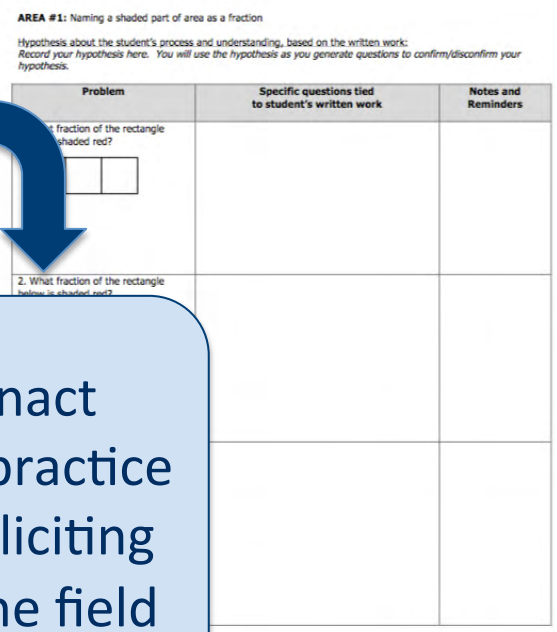
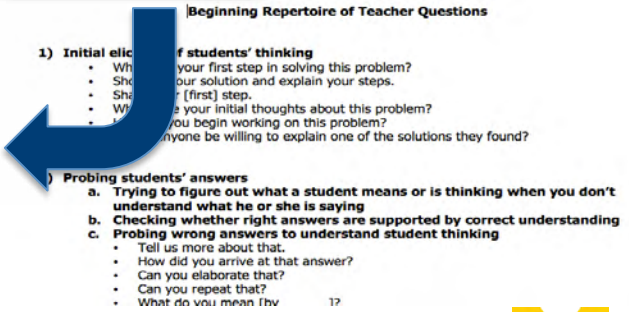
INTERNS' WORK ON ELICITING IN THE CONTEXT OF INTERVIEW ASSIGNMENTS

Prepare to elicit a student's thinking



Enact the practice of eliciting in the field



Analyze the video record of the enactment

Consider instructor feedback on the enactment

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OTHER COURSE FEATURES THAT SUPPORT INTERNS' ELICITING

- Work on relevant mathematics content alongside working on practices of eliciting, including
  - Definition of a fraction
  - Area model and number line representations
  - Strategies for comparing fractions, generating equivalent fractions
  - Fraction computation
- Learn common patterns of student thinking about fractions

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ACROSS THESE EXPERIENCES

Learn to pose questions that enable a student to share his/her thinking

Develop an inclination to consider processes/approaches that differ from one's own and carefully evaluating them

Develop mathematical knowledge for teaching

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④ SKILLS OF TEACHING INTERNS AT THE MID-POINT OF THE PROGRAM

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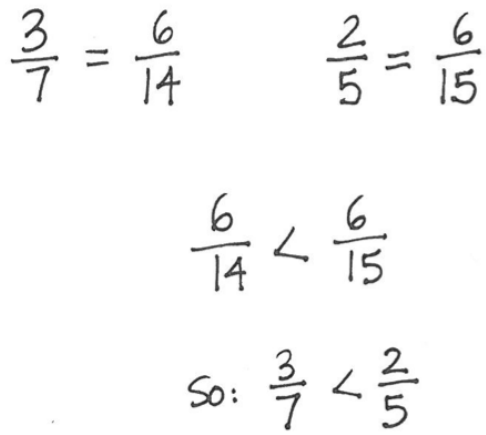
ASSESSING SKILLS OF ELICITING AND INTERPRETING STUDENT THINKING *(AGAIN)*

CONTEXT

- **Focus**: Eliciting and interpreting student thinking with particular mathematics content
- **Timing:** End of the first year in the program; after coursework focused on eliciting and interpreting student thinking

ASSESSMENT PROMPT

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



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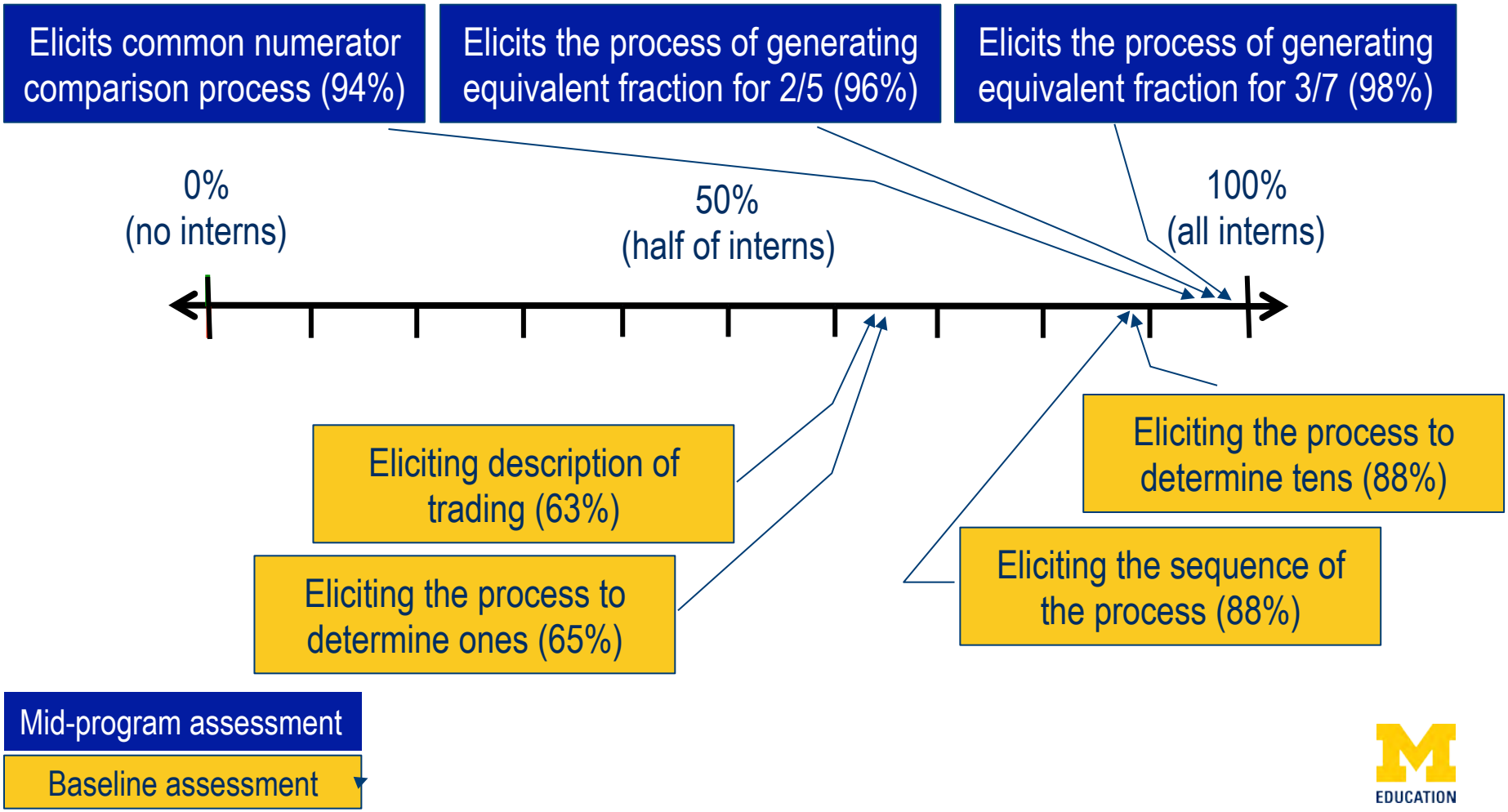
PREVALENCE OF ELICITING MOVES: ELICITING PROCESS MID-PROGRAM



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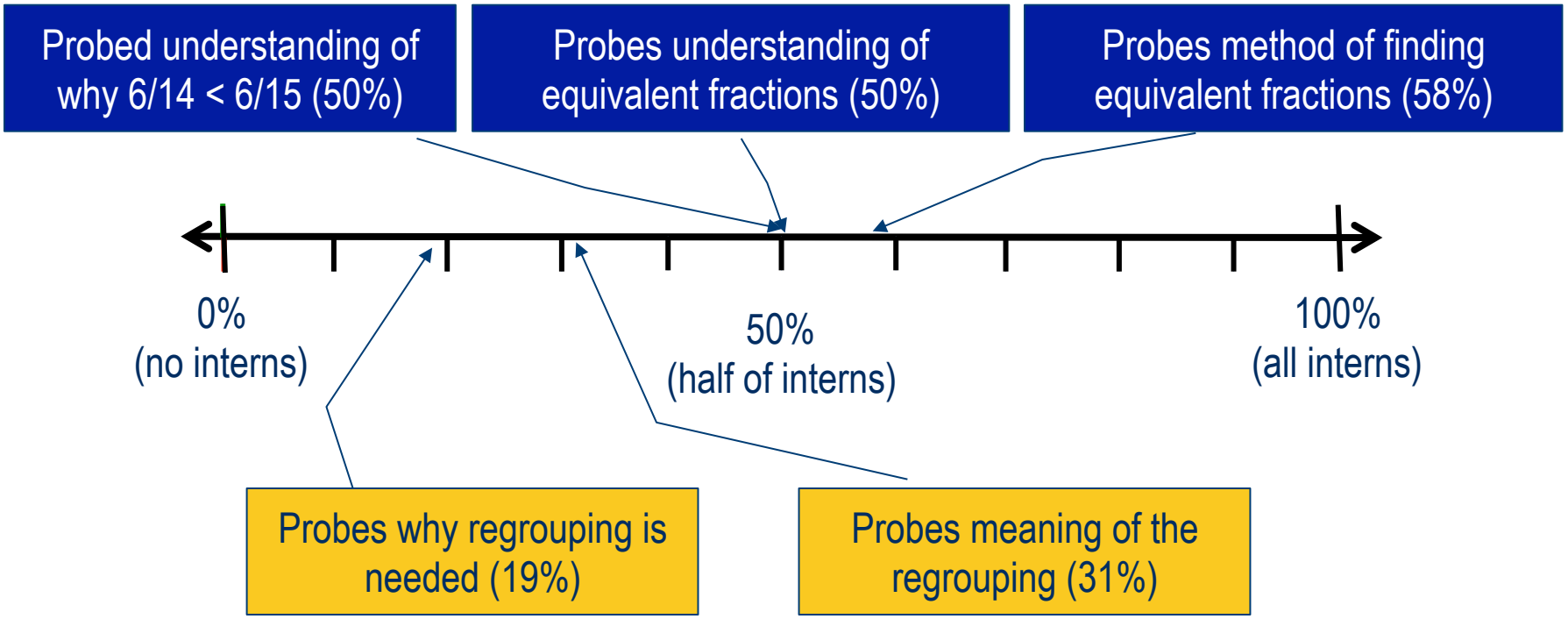
PREVALENCE OF ELICITING MOVES: ELICITING UNDERSTANDING MID-PROGRAM



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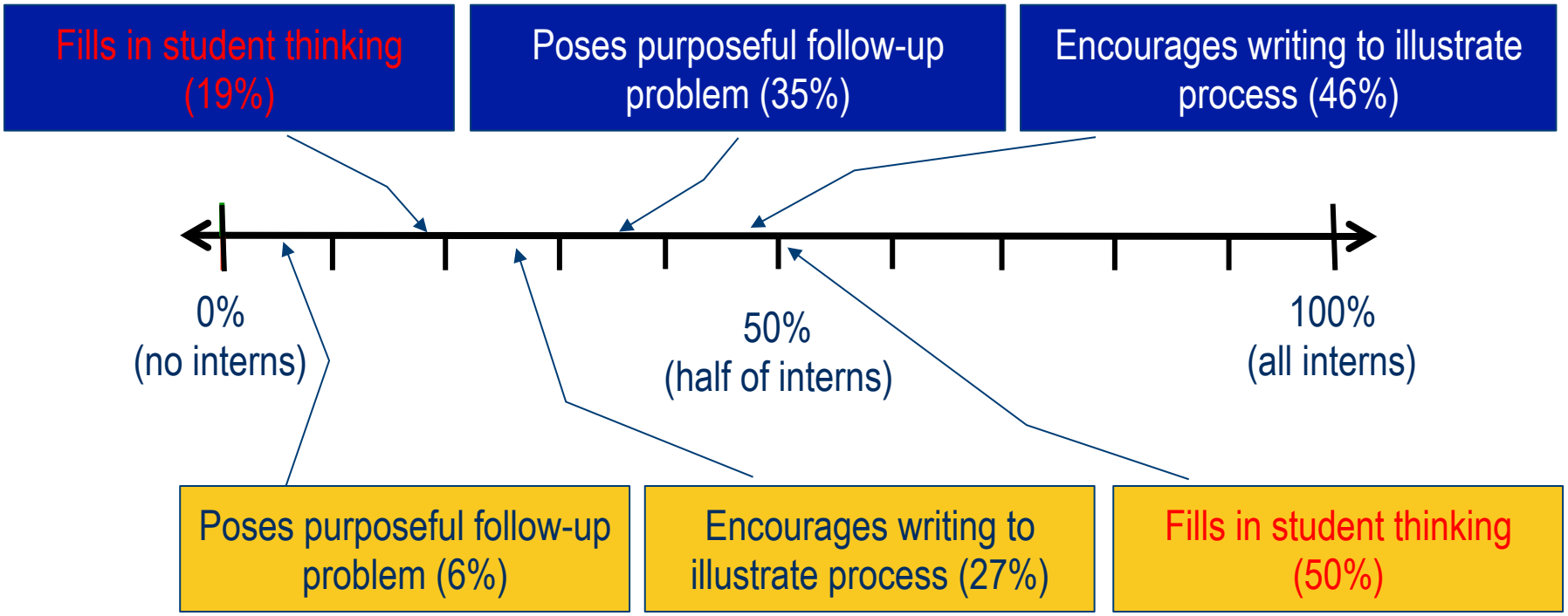
PREVALENCE OF ELICITING MOVES: OTHER ELICITING MOVES MID-PROGRAM



Mid-program assessment

Baseline assessment

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⑤ NEXT STEPS

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NEXT STEPS:
SUPPORTING THE LEARNING OF INTERNS

Instructors can support interns as they:

- Work on particular aspects of their teaching
- Become more discerning about which aspects of student thinking to crucial to probe
- Enhance their skill with eliciting in the context of other teaching practices in subsequent semesters

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NEXT STEPS: ASSESSMENT DEVELOPMENT

- Explore different simulation design features and combinations
  - Changing the student's "way of being"
  - Juxtaposing different mathematical approaches (invented/ standard) with different outcomes (correct/incorrect)
- Develop scaffolds for those learning the role of the standardized student
- Develop performance thresholds for different points in teacher development
- Explore different ways of designing simulations
  - Select generative cases of actual student approaches
  - Select from research on student thinking

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NEXT STEPS: RESEARCH

- Validation studies that connect performance in simulations with performance in classroom contexts
- Studies of how different simulation scenarios function (relative difficulty, comparability)
- Studies of the intersection between mathematical knowledge and the practices of eliciting and interpreting

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