Mathematics

TOPICS IN EDUCATION

Elicit and Use Evidence of Student Thinking during Instruction

Using Student Thinking to Inform Instructional Decisions

Grace Kelemanik and Amy Lucenta

by i-Ready

Meet the Authors

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TOPICS IN EDUCATION

Introduction

Teaching is a responsive endeavor. Despite some of our experiences as learners, classrooms do not maximize learning gains when students passively listen to teacher explanations and watch examples before trying to apply ideas independently. Instead, students achieve greater learning gains when they actively make sense of mathematical concepts, talk through their initial understandings, and develop deeper conceptual knowledge through mathematical discourse. As students talk and work through rough-draft iterations of their understandings, teachers can make sense of how students are developing understanding and make in-the-moment decisions to further their learning.

Our role as educators is to be purposeful in uncovering students' thinking in multiple ways and leverage it to further both individual and class progress toward the learning goals of the lesson. The National Council of Teachers of Mathematics (NCTM) highlights this as one of their eight Effective Teaching Practices articulated in *Principles to Actions* (NCTM, 2024): *Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning*.

This practice is critical and complex, as students demonstrate their understanding in myriad ways—in written form on do nows, Start questions, exit tickets, or assessments, and verbally throughout class when they share their thinking with a partner or in front of the whole class. In this paper, we will unpack opportunities to elicit student thinking as it evolves throughout a lesson and strategies to use it to advance student thinking.

Before we can even talk about eliciting and making use of evidence of student thinking, we need to consider the learning goals and the tasks students engage in. Simply put, we can't elicit student thinking unless students have an opportunity to think and reason. It's imperative that we provide students with high-cognitive-demand tasks that challenge them to think mathematically and focus on their reasoning. As soon as our attention shifts to a correct answer or process, we devalue the thinking that led to those answers. Students may then be less inclined to provide evidence of their thinking and focus instead on whether their answers are correct.

Additionally, it's important that we anticipate how we might make use of student thinking, and the key to that lies in the lesson goal. Once we ensure our tasks invite and promote mathematical thinking, our next step is to think deeply about how students will think about the task and how their multiple approaches relate to the lesson goal, as shown in Figure 1 on the next page.

Notice how the task in Figure 1 invites and promotes mathematical thinking, supports multiple approaches, and connects to the lesson goal. In addition, the teacher is invited to explore possible approaches to take when they approach the task and think about how they work in service of the lesson goal.

LESSON 17 SESSION 2 ● ● ○ ○

Develop Regrouping Tens to Ones

Read and try to solve the problem below.

One day there are 450 camp sites being used at Yosemite National Park. 218 of the sites have a camper. The rest have a tent. How many of the camp sites have a tent?

TRY IT

Math Toolkit
- base-ten blocks
- hundred charts
- hundreds place-value mats
- open number lines

DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: The strategy I used to find the answer was . . .

Explore different ways to understand subtracting three-digit numbers.

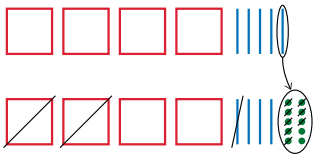
One day there are 450 camp sites being used at Yosemite National Park. 218 of the sites have a camper. The rest have a tent. How many of the camp sites have a tent?

PICTURE IT

You can make a quick drawing.

Show 450.

Regroup 1 ten as 10 ones. Then take away 218.



MODEL IT

You can subtract hundreds, tens, and ones.

Think: 218 = 200 + 10 + 8

450
− 200
250
− 10
240
− 8
?

MODEL IT

You can break apart the numbers.

Look at the ones: 0 < 8.
Regroup 1 ten as 10 ones.
Then subtract.

450 → 400 + 40 + 10
− 218 → 200 + 10 + 8
200 + 30 + 2

Figure 1: *Grade 2 tasks, core math curriculum by* i-Ready

It's imperative that we provide students with high-cognitive-demand tasks that challenge them to think mathematically and focus on their reasoning. As soon as our attention shifts to a correct answer or process, we devalue the thinking that led to those answers. Students may then be less inclined to provide evidence of their thinking and focus instead on whether their answers are correct.

Elicit and Use Evidence of Student Thinking Cycle

During a mathematics class, there are multiple opportunities to *prompt* students' thinking: when students consider a teacher's question, a high-demand task, a classmate's idea, or a new representation. Our goal is to hear and see how students are thinking—that is, to *surface* their thinking so it is audible and/or visible to us as teachers and, ideally, to partners or classmates as well.

Once we surface student thinking, we enter an important and often challenging process: making sense of the thinking produced. This involves intaking and interpreting student responses and then deciding how to use them to support students' development toward the lesson goal. This is less challenging when we hear from just one or two students and much more challenging when we need to *intake*, *interpret*, and *decide* based on thinking from every partnership, small group, or individual student in the class. Once we *enact* our decision, it often leads to prompting and surfacing additional thinking.

As we unpack what it means to elicit and use evidence of student thinking, it will be helpful to consider the graphic below, which provides further details of the practice and process.

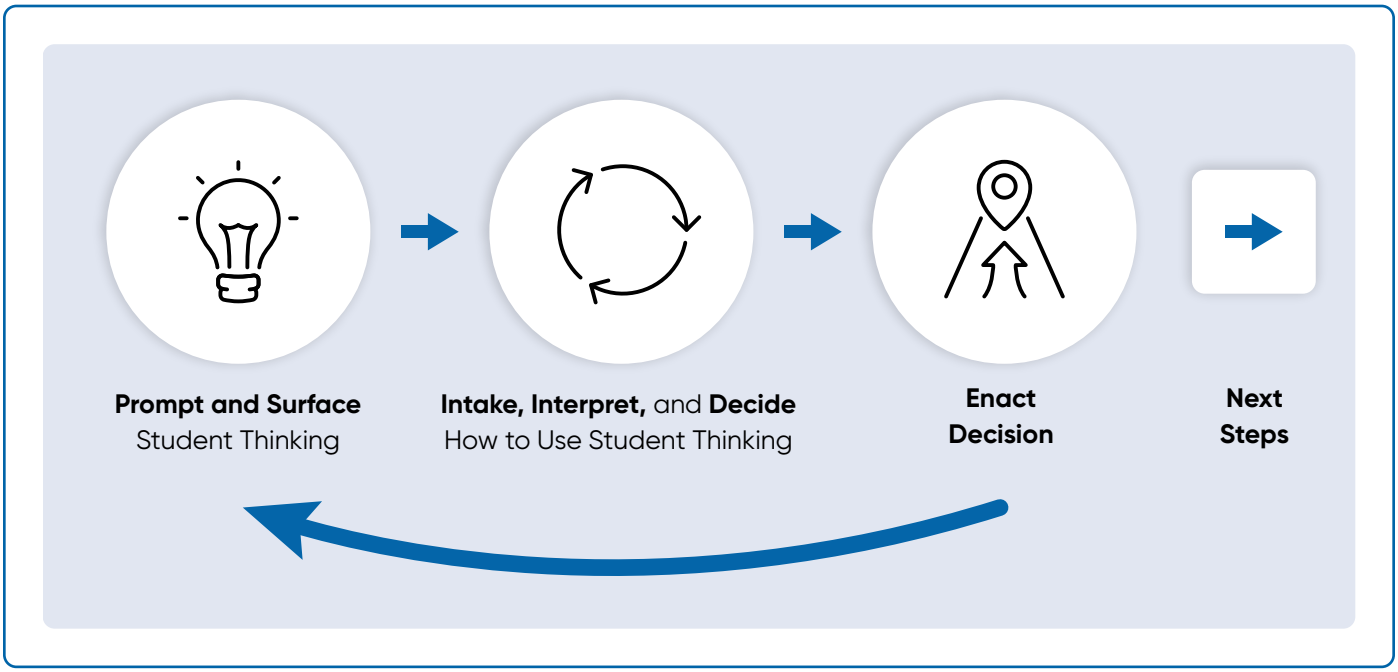


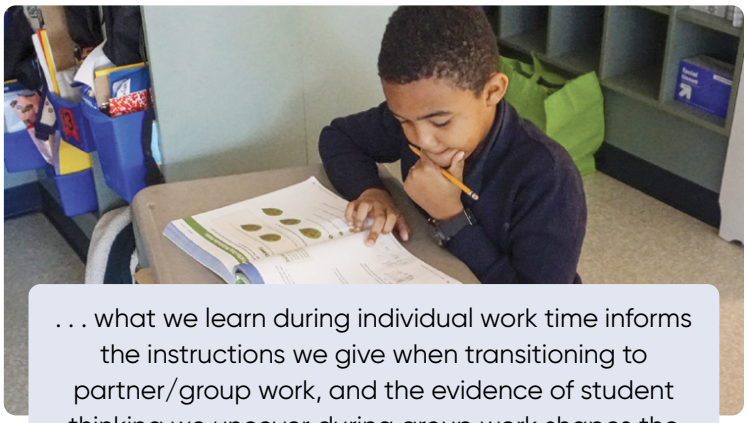
Figure 2: *The process of eliciting and using evidence of student thinking follows a repeated cycle.*

Our processes for enacting the cycle of eliciting and using evidence of student thinking varies depending on the classroom structure. We will unpack that process by focusing on three key opportunities within a typical lesson.

Three Opportunities for Eliciting and Using Evidence of Student Thinking

Eliciting and using evidence of student thinking is a critical teaching practice in lessons where students are co-constructing an understanding of important mathematical concepts or working together to solve non-routine mathematics problems. Typically, such lessons involve students working individually for a short time to make sense of the problem, then transitioning to working with a partner or in a small group, and finally, engaging in whole class discussions to share, discuss, and build on each other's ideas.

The three opportunities—individual work, partner or small group work, and whole class discussions—provide opportunities for teachers to cyclically elicit and use evidence of student thinking. The evidence of student thinking elicited in each stage inform the next. For example, what we learn during individual work time informs the instructions we give when transitioning to partner/group work, and the evidence of student thinking we uncover during group work shapes the whole class discussion we facilitate. This structured approach to problem solving should incorporate research-based practices for eliciting and using evidence of student thinking. (See Figure 3.)



. . . what we learn during individual work time informs the instructions we give when transitioning to partner/group work, and the evidence of student thinking we uncover during group work shapes the whole class discussion we facilitate.

Eliciting and Using Evidence of Student Thinking in the Try–Discuss–Connect Instructional Framework

TRY IT

- Make sense of the problem.
- Solve and support your thinking.

1 Individual Think Time

DISCUSS IT

- Share your thinking with a partner.

2 Partner/Small Group Time

- Compare strategies.

3 Whole Class Discussion

CONNECT IT

- Make connections and reflect on what you have learned.
- Apply your thinking to new problems.

Figure 3: *The Try–Discuss–Connect instructional framework that is part of the core math lesson design builds in time to allow teachers to elicit and use evidence of student thinking. Note that students transition from individual sensemaking to partner/small group work to full group discussion.*

The practice of eliciting and using evidence of student thinking during this type of lesson places the teacher squarely in the role of facilitator. To support collaborative sensemaking, it's important that we surface and consider the variety, commonalities, and differences between students' lines of thinking to make in-the-moment instructional decisions that advance the group's thinking. The first step is intaking student thinking, which happens throughout the lesson during the individual think time, partner or small group work, and the whole class discussion.

1 ELICITING AND USING EVIDENCE OF STUDENT THINKING
When Students Are Working Individually

Prompt and Surface Student Thinking

Students need time to make sense of a task to engage productively with a partner or small group. Having students pause and process the mathematical task at hand before beginning to work or calculate not only prompts students' thinking but also supports their sensemaking process. It is then important to give students individual think time to contemplate ideas and approaches for solving the problem. While students may not completely solve the task at this point, this individual think time offers a critical preview of the potential lines of thinking in the classroom. To effectively surface thinking during individual work time, consider how students might express their thinking—through drawn visuals, manipulatives, mathematical models, written strategies, or other representations.

Strategies to prompt and surface thinking when students are working individually are prompting students to:

- Record what they notice about a mathematical situation
- List important information or what they know about the situation
- Annotate the problem so you can see what they are paying attention to
- Represent the situation with a drawing, manipulative, mathematical diagram, written strategy, or other representation

Intake, Interpret, and Decide How to Use Student Thinking

As students work individually, the teacher's role is to tour the room and watch what students are doing in order to interpret their initial sensemaking and strategies. Questions to think about include:

- Are students actively reading the problem, identifying the question to be answered, highlighting important information, jotting down questions they have, and representing the problem numerically, visually, or with manipulatives?
- Are all students getting started, or have some paused? If so, how many?
- Look at students' work: Have they moved beyond sensemaking and begun to solve the problem?

During lessons where students are co-constructing knowledge, knowing how one or two students are thinking is essential for gauging the class's overall progress in interpreting the problem.

The key decision to make when students are working individually is when to transition to partner or small group work. The goal is to provide every student enough time to begin understanding the problem and maybe start a solution path, but not necessarily to fully solve the problem. Partner or small group work is less productive if a student enters it and has already committed to a solution strategy or found an answer. When this happens, the student typically starts by telling their partner(s) the answer or how to solve the problem, thereby shutting down their classmates' thinking. The goal of individual student work time is to gain familiarity with the task at hand—not necessarily to complete a final solution.

Not all individual think time results in all students understanding the problem at the same time, especially when dealing with new or challenging concepts that require deep thinking. Transition to partner or small group work once you see evidence that all students are beginning to make sense of the problem (i.e., students know what is being asked of them, have begun to identify important information, and have started developing a solution strategy).

As you interpret classroom evidence, it may be helpful to ask:

- How many students are working productively on the task?
- How many students have paused their sensemaking?
- How many students have misinterpreted the question?
- How many students have missed critical information?
- Are there common approaches to the problem?

The evidence collected during individual think time will inform the decisions and prompts to use when pulling the class together and transitioning students to partner or small group work. If all goes as planned, individual students have made sense of the task and are ready to work collaboratively with a partner or small group. Sometimes the evidence suggests otherwise.

Enact Teacher Decisions about Student Thinking

While it may be difficult to observe flawed student thinking without stepping in to instruct or redirect, our commitment to collaborative student sensemaking needs to prevail. We can use all the evidence we've collected to launch partner or small group work productively for students to be the ones working out the ideas. Here are some potential scenarios with possible decisions to enact.

Observations	Possible Enactment
Observation 1 A large number (i.e., more than half) of students have paused their sensemaking.	Pull the class back together and prompt students to identify the things they understand about the problem, a question they have about the task, or something about it that is confusing, provide 30–45 seconds of individual think time, transition to partner or small groups, and have students begin by sharing their understanding, questions, or confusions. Then listen in!
Observation 2 A large number (i.e., more than half) of students have misinterpreted the question.	Pull the class back together and prompt students to rephrase the question in their own words, provide 30–45 seconds of individual think time, transition to partner or small groups, and have students begin by sharing their restated questions. Then listen in!
Observation 3 A large number (i.e., more than half) of students have missed a critical piece of information.	Pull the class back together and prompt students to identify the key information (including the missed details), provide 30–45 seconds of individual think time, transition to partner or small groups, and have students begin by sharing the important information they identified. Then listen in!
Observation 4 A large number (i.e., more than half) of students have the same initial approach (i.e., representation) to solving the problem.	Pull the class back together and prompt students to think about more ways to represent the problem, provide 30–60 seconds of individual think time, transition to partner or small groups, and have students begin by brainstorming different ways to represent the problem. Then listen in!

In each of these examples, the recommendation is to provide a prompt that orients students to the challenge, provide a short amount of individual think time to consider the prompt, and then transition to partner or small group work and have students begin by sharing their response to the orienting prompt you posed. As students share, they will gain new insights and traction into the problem and be ready to work collaboratively. Once we have prompted and surfaced student thinking through individual think time, we can intake, interpret, and decide as students work in collaborative groups—beginning the Elicit and Use Evidence of Student Thinking Cycle (shown in Figure 2) again!

Supporting Partner or Small Group Conversations with Sentence Frames and Questions

Sentence frames are powerful tools for uncovering student thinking and making it audible. A well-crafted sentence frame orients and helps students share their thinking and reasoning. For the observations in the table on the previous page, it would be helpful to include a sentence frame to launch partner or small group work. For Observation 1, for example, you might provide sentence frames like, "I understand . . ., but I don't get . . ." or "A question I have about . . . is . . ." to prompt and surface their thinking.

Sentence frames are also indispensable supports for pair, small group, and whole class discussions because they both help students share their reasoning and prepare the listener for what is about to be said. In this way, they help students hear and make sense of each other's thinking, making collaborative work more productive. They also support teachers to intake and interpret student thinking.

When students ask their classmates questions, it is an opportunity to intake student thinking. Not only does a student question provide an opportunity to hear student thinking in the response (e.g., "How did you think to do that?," "Why did you start there?"), the question itself often is a window into the questioner's thinking (e.g., "I'm not sure about . . ., can you explain?"), supporting teachers as they prepare to make decisions. The Math Discourse Cards (available in English and Spanish, shown in Figure 4) provide numerous sentence frames and discourse questions you can use to elicit evidence of student thinking.

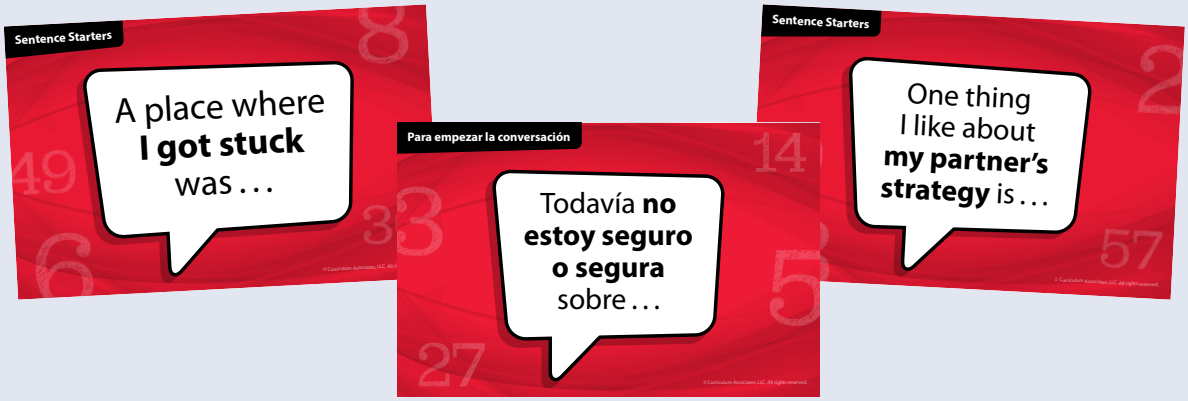
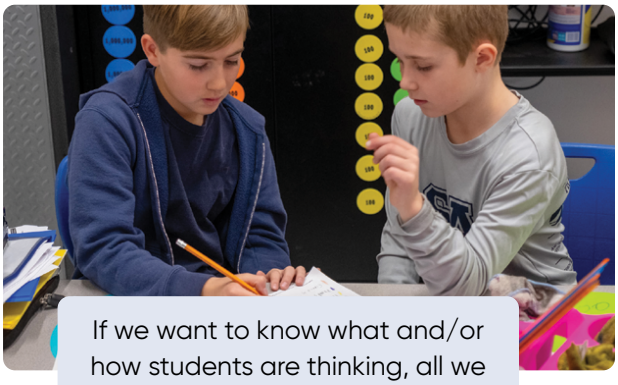


Figure 4: *Sample sentence frames that are part of the Math Discourse Cards—available in English and Spanish*

When Students Are Working with a Partner or in a Small Group

Prompt and Surface Student Thinking

When students work with a partner or in a small group, we hear (and see!) more of their thinking because they are sharing their reasoning. When students work together to solve a problem, they explain and ask for their partner to explain. They ask questions and answer their classmate's questions. They justify their thinking and ask their classmate to justify theirs. They talk through options, multiple perspectives, and approaches, and teachers can intake all this information. If we want to know what and/or how students are thinking, all we need to do is get them talking.



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"I try to ask questions that are open ended that really encourage the students to explain their thinking," Grade 4 teacher Madeline Burch explained. "It gives me a glimpse into what they're thinking, what they're understanding." Partner and small group work create a valuable space for student thinking to surface, with partner work surfacing more audible thinking and small groups inviting additional perspectives. Whether students are working in small groups or with partners, we have plenty of opportunities to see and hear their thinking.

Strategies to prompt and surface thinking when students are working with a partner or in a small group include prompting them to:

- Explain to their partner what they think the problem is asking
- Share what they've noticed about the problem with a partner and use that to elaborate upon in their solution process
- Share and combine their lists of important information
- Compare their approaches (e.g., drawings, manipulatives, mathematical diagrams, and other representations)

Intake, Interpret, and Decide How to Use Student Thinking

The goal of intaking and interpreting student thinking during partner or small group work is to gain a sense of the variety of student approaches so you can decide which approaches to bring to the full group. These decisions include not only which students' approaches to discuss, but also the order in which they will be discussed, who will present them, and the questions you will ask to help students think through one another's reasoning to understand the lesson goal(s).

Intaking student thinking during partner or small group work is all about timing. Because the goal is to have an overall sense of the thinking in the room, you must know the thinking of each pair or small group—or as many as possible. This means touring the room and leveraging all the ways in which you are surfacing student thinking—briefly listening in on partners talking and looking at their written work, the manipulatives they are using, and even their gestures to understand their current thinking.

As you walk around observing, stay with a group for a short time and then move on to the next. Student thinking is constantly developing and shifting, so circle back and tour the room again to get a sense of how their thinking has progressed in each group. Intake is an exercise in "just enough." Stay with each pair just long enough to get a sense of how they are thinking, and then move on and do the same with the remaining pairs so you can get a sense of the full range of thinking in the room.

During partner time, we are laser-focused on intaking student thinking and avoiding stepping in to provide direct instruction. In our view (and in Try–Discuss–Connect, shown in Figure 3), partner work is a time for students to collaboratively develop viable strategies. Having said that, there may be times when a pair has gotten stuck and/or stopped working, and they need a jumpstart. In this case, pose a question based on the pair's thinking to reorient them, and then walk away so they can re-engage with the task.

Learn more about promoting productive struggle.

As you gather student thinking, note students' different approaches to the problem. Is there a common approach many students are using or a unique approach that will not confuse most students? Did any students use a strategy that directly aligns with the lesson goals? Jot down any connections you see between the various student approaches, and capture any common mistakes or surfaced misconceptions. This evidence will inform your next teaching decisions.

Some helpful tips:

- Be strategic about where you stand. Arrange the room so you can place yourself between three or four partnerships so with minimal movement, you can lean in and hear what each group is saying.
- Position yourself so that as you listen to one group, you can still see other groups and watch for the gestures students use to support their communication.
- Take a moment to scan multiple groups' written work. Often we can see big ideas through visual representations or manipulatives.
- Take notes. Create and use a notetaker based on the strategies you anticipated when planning, and use it to identify which students will share their strategies in the whole class discussion and in what order.
- Be open to creative thinking. Often students surprise us by approaching problems in ways we have not considered but that may advance the class's understanding toward the lesson goal.
- Listen authentically. Brilliant mathematical thinking often starts with imprecise language.

"One of the shifts that I made this year was that I did the math ahead of time and anticipated the strategies that students might use, and then when students start working, I'm going around and I'm looking for examples of different strategies from students. I'll write students' names by each of the strategies and then have the students share."

—David Breese, Grade 6 Teacher

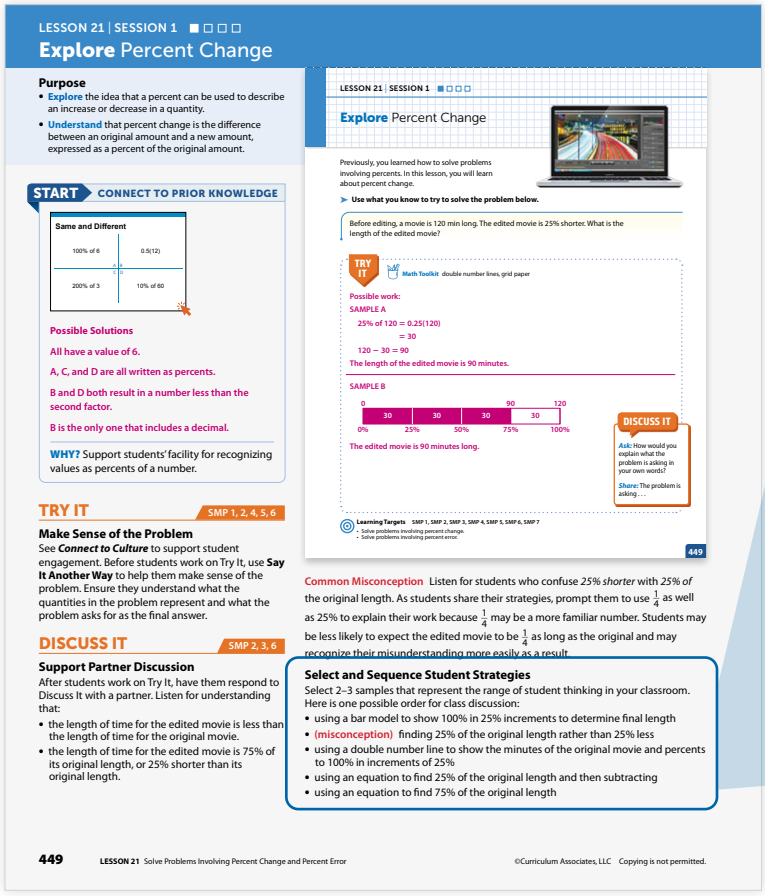
The most productive whole class discussions are those that are informed by student thinking the teacher elicited during partner or small group work. Students are ready to consider ideas from classmates. Now it is time to decide which ideas to use and how to help students weave them together into a coherent whole, drawing connections between them to deepen understanding—all in service of the lesson goal.

As you interpret the thinking from partners and small groups, ask yourself:

- Did students use a variety of strategies, or were they similar?
- Has a partnership generated a representation or strategy that would help establish a common understanding for everyone?
- Which strategies should I choose and in what sequence should they be presented to build a progression of understanding that helps students achieve the lesson goals?
- Are there varying representations between partnerships/small groups?
- Are there strategies based on misconceptions that would be helpful to highlight?
- Are there strategies that would help uncover misconceptions?

It is important to keep the goals of the lesson in mind when choosing which strategies to discuss as a class and possible ways to sequence them. Some programs may provide suggestions for selecting and sequencing strategies, such as the sample guidance shown in Figure 5 from the *i-Ready* core math program.

Learn more about selecting and sequencing student strategies.



LESSON 21 | SESSION 1

Explore Percent Change

Purpose

- **Explore** the idea that a percent can be used to describe an increase or decrease in a quantity.
- **Understand** that percent change is the difference between an original amount and a new amount, expressed as a percent of the original amount.

START CONNECT TO PRIOR KNOWLEDGE

Same and Different

100% of 6	0.5(12)
200% of 3	10% of 60

Possible Solutions

All have a value of 6.

A, C, and D are all written as percents.

B and D both result in a number less than the second factor.

B is the only one that includes a decimal.

WHY? Support students' facility for recognizing values as percents of a number.

TRY IT SMP 1, 2, 4, 5, 6

Make Sense of the Problem

See ***Connect to Culture*** to support student engagement. Before students work on Try It, use **Say It Another Way** to help them make sense of the problem. Ensure they understand what the quantities in the problem represent and what the problem asks for as the final answer.

DISCUSS IT SMP 2, 3, 6

Support Partner Discussion

After students work on Try It, have them respond to Discuss It with a partner. Listen for understanding that:

- the length of time for the edited movie is less than the length of time for the original movie.
- the length of time for the edited movie is 75% of its original length, or 25% shorter than its original length.

LESSON 21 | SESSION 1

Explore Percent Change

Previously, you learned how to solve problems involving percents. In this lesson, you will learn about percent change.

Use what you know to try to solve the problem below.

Before editing, a movie is 120 min long. The edited movie is 25% shorter. What is the length of the edited movie?

TRY IT Math Toolkit double number lines, grid paper

Possible work:

SAMPLE A

25% of 120 = 0.25(120)

= 30

120 − 30 = 90

The length of the edited movie is 90 minutes.

SAMPLE B

0 30 60 90 120

0% 25% 50% 75% 100%

The edited movie is 90 minutes long.

DISCUSS IT

Ask: How would you explain what the problem is asking in your own words?

Share: The problem is asking . . .

Learning Targets SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6, SMP 7

- Solve problems involving percent change.
- Solve problems involving percent error.

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Common Misconception Listen for students who confuse *25% shorter* with *25% of* the original length. As students share their strategies, prompt them to use $\frac{1}{4}$ as well as 25% to explain their work because $\frac{1}{4}$ may be a more familiar number. Students may be less likely to expect the edited movie to be $\frac{1}{4}$ as long as the original and may recognize their misunderstanding more easily as a result.

Select and Sequence Student Strategies

Select 2–3 samples that represent the range of student thinking in your classroom. Here is one possible order for class discussion:

- using a bar model to show 100% in 25% increments to determine final length
- (misconception) finding 25% of the original length rather than 25% less
- using a double number line to show the minutes of the original movie and percents to 100% in increments of 25%
- using an equation to find 25% of the original length and then subtracting
- using an equation to find 75% of the original length

449 LESSON 21 Solve Problems Involving Percent Change and Percent Error ©Curriculum Associates, LLC Copying is not permitted.

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- using a double number line to show the minutes of the original movie and percents to 100% in increments of 25%
- using an equation to find 25% of the original length and then subtracting
- using an equation to find 75% of the original length

Figure 5: *Sample guidance for selecting and sequencing student strategies for a Grade 7 lesson on percentages*

Enact Teacher Decisions about Student Thinking

The evidence collected during partner and small group work will inform our decisions and prompts when facilitating the whole class discussion. We start by processing the range of thinking we observed in the room and likely reviewing our notes. We consider the breadth and depth of the solution strategies in the room, knowing there will not be time to discuss every pair's or small group's solution strategy. We then select two to four solution strategies to discuss and sequence so student understanding will develop over the course of the conversation. Below are some common strategies to implement when selecting and sequencing student ideas for a full group discussion.

"I try to kind of build strategies off of each other, so maybe where I saw one student begin their thinking, I then try to have the next student build on what they learned, and kind of get more complex, or more rigorous, or use different strategies. I try to sequence them in a way where students can see the thinking progression."

—Madeline Burch, Grade 4 Teacher

Observations	Possible Enactment
Observation 1 There's a misunderstanding common to a number of students in the room.	Start with a familiar representation that will afford students the opportunity to build conceptual understanding based on previous/current content knowledge before layering in additional ideas.
Observation 2 There's a prevalent approach in the room.	Start with the prevalent approach so you are honoring the thinking of many students at once.
Observation 3 Students use manipulatives, diagrams, and numeric/algebraic expressions.	Sequence ideas on the concrete–representational–abstract trajectory. Build from one solution strategy to the next so the approaches increase in sophistication and mathematical precision. In this way, the discussion of one approach will set students up to make sense of the next approach.
Observation 4 There are at least two representations or strategies that can be leveraged to develop the lesson goal(s).	Ask students to make connections between two or more representations to deepen understanding. Asking students to connect seemingly disparate approaches positions them to interpret and reinterpret representations and make mathematical connections.
Observation 5 There's disagreement in the room.	Have students compare and contrast approaches, discuss mistakes and misconceptions, and discuss reasonableness of results.

Some helpful tips before you facilitate a whole class discussion:

- Let students know in advance that you'd like them to share their strategy and be specific about what aspects of their work you'd like them to share. You may tap a student on the shoulder (even pointing to an aspect of their work) and say, "Could you please share this idea with the whole class?"
- Think about how you will make students' work public and lasting so all presented work remains visible throughout the discussion. This is critical for connecting, comparing, and contrasting student ideas.
- For example, will students who share their ideas all stay standing throughout each explanation? Will the teacher record student ideas or will students display their work?
- Students may not come up with the models or strategies that are the focus of the lesson goal(s). Be sure to have sample solutions showing standards-aligned strategies and models matching the goals of the lesson for students to review and explain.
- When you have a choice of partnerships who could share a strategy that would be helpful for the class to analyze, consider the status and positionality of students in the room. Try to have as many students as possible share their ideas over the course of a week, and avoid having the same students always sharing.

ELICITING AND USING EVIDENCE OF STUDENT THINKING

3 In the Whole Class Discussion

Prompt and Surface Student Thinking

Now that you've spent time prompting and surfacing student thinking throughout the lesson, it's time to orchestrate a whole class discussion that leverages, connects, and advances all the thinking that students have developed.

During the whole class discussion, our work shifts from prompting and surfacing student thinking for our own decision-making process toward prompting and surfacing thinking for learning. We now need to ensure the discussion highlights the key aspects of a student's strategy to make the thinking public for the class to learn from.

We are prompting and surfacing student thinking every time we ask a student partnership to share a strategy. Then, we enter the intake–interpret–decide portion of the Eliciting and Using Evidence of Student Thinking Cycle from Figure 2 as students make sense of and discuss their classmates' approaches. The cycle continues with each student-generated strategy the class analyzes. Throughout the whole class discussion, we find ourselves leaning into two essential teaching strategies—Turn and Talks and the Four Rs—to further elicit and make use of student thinking. These teaching routines engage all students in thinking and processing the mathematical ideas of their peers, which is a key to building mathematical understanding and retention (Kelemanik, Lucenta, & Creighton, 2016). Let's take a quick look at each strategy and then consider its role in the whole class discussion.

Turn and Talks

Turn and Talks are a brief opportunity for students to work out an idea and the accompanying language in a risk-free collaborative setting. They also provide teachers a window into a lot of students' thinking in a short amount of time. Turn and Talks are particularly helpful when you aren't sure how kids are making sense of an idea or when you want to hear how they are beginning to internalize an idea. Figure 6 highlights strategies to use for successful Turn and Talks.

Getting Started with Turn and Talks

- **Anticipate key ideas while planning a lesson**, and develop a Turn and Talk around these key ideas. *(Example: For a lesson on adding two-digit numbers with regrouping, Turn and Talks might focus on the why, when, and how of regrouping.)*
- **Assign which partner will begin talking.** *(Example: If you are sitting closer to the window, you will share first.)*
- **Provide students a time frame for the Turn and Talk.** *(Example: Turn and talk to your partner—you'll have 45 seconds.)* While you may adjust the timing in the moment, the short time frame provides some urgency for students to get started.
- **Provide sentence frames for students to use when they turn and talk.** This will support students' language development and serve as a product for the Turn and Talk. *(Example: Partner 1, start with "I knew . . . so I . . ." Partner 2, respond by starting with "I agree/disagree with you because . . .")*

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: I knew . . . so I . . .

Figure 6: *Strategies for successful Turn and Talks (Kelemanik & Lucenta, 2019)*

The Four Rs

The Four Rs—Repeat, Rephrase, Reword, and Record—are a suite of prompts that provide students opportunities to process and reprocess verbal explanations and provide teachers opportunities to hear how students are making sense of the ideas shared.

- **Repeat:** If we aren't sure if students have all heard another student's idea, we ask a student (or the original speaker) to repeat what was said. This is especially helpful if the student spoke in a soft voice, if a fan came on, or other such reasons why all students might not hear the idea. The teacher might use student-friendly language such as, "Who can say exactly what Maria said?"
- **Rephrase:** Once we are confident all students have heard the idea and we want students to process the idea, we prompt students to share another student's idea in their own way—to rephrase what was said. The teacher might say, "Who can say that in another way?"
- **Reword:** If we'd like for students to add increasingly precise language to the idea, we ask students to reword the idea. The teacher might say, "How could we say that using some of our math vocabulary?" or "What is another way we could say that using mathematical language?"
- **Record:** If there are ideas that would be helpful for students to see to accompany the discourse, we record language and ideas to provide residue of the conversation—something students can look back on to recall the classroom discourse. All the while, we are hearing how students are making sense of the original idea through the rephrasing and rewording.

Turn and Talks and the Four Rs are used to engage all students in doing the thinking, talking, and processing of others' ideas. Together, these moves can be combined to allow teachers to engage the class while surfacing student thinking. A sample classroom conversation is shown in Figure 7 and is based on the work of Kelemanik et al. (2016).

Maria (*in a soft voice*): I added three and then added two more.

Teacher: Who can say exactly what Maria said, as I don't think everyone heard?

Kevin: Maria said, "I added three and then added two more."

Teacher: Ok. Who can say what Maria said in another way?

Julie: She added three and then added two more and got 12.

Teacher: Are there any math words we could add to what Maria said to be even more precise?

Julio: She added three and then she added two more and got **a sum** of 12.

Teacher: Turn and talk to your partner. Why did Maria add three and then two more? Be ready to explain why you think Maria added three and then two more.

Figure 7: *A sample classroom dialogue using Turn and Talks and the Four Rs to engage the class and surface student thinking during whole class conversations*

In the scenario shown in Figure 7, as students share out after the Turn and Talk, the teacher might record the language and ideas students share to provide a visual record of the classroom conversation.

Intake, Interpret, and Decide How to Use Student Thinking

Intaking student thinking during whole class discussions is even more responsive in the moment than during individual think time and small group or partner work. Throughout the whole class discussion, we are observing how students are making sense of the ideas and then making decisions regarding how best to work with the ideas toward our lesson goal. We use student thinking and multiple strategies to deepen understanding of the ideas and then leverage it even more to make deeper connections toward the lesson goal, all while monitoring progress and adjusting our responses accordingly. All of this is happening in real time, so we engage multiple strategies to support our decision-making processes.

As you interpret the thinking during the whole class discussion, ask yourself:

- Did the partnership share their thinking—not just the answer?
- Did students hear the idea shared?
- Do students need to reprocess the idea?
- Is there disagreement in the room about a strategy shared?
- Do students need to explicitly connect the strategy to the lesson goal?

Learn more about these strategies in Integrating Effective Teaching Practices.

Enact Teacher Decisions about Student Thinking

During the whole class discussion, the decisions we make are related to both the ideas being shared and how classmates are making sense of them.

Observations	Possible Enactment
Observation 1 The partnership focused on the answer rather than the thinking behind the answer when they shared their solution strategy.	Prompt student presenters to begin by sharing their initial thinking, using a sentence frame like: • "We noticed . . . so we . . ." • "We represented . . . by . . ." • "When we saw . . . it made us think . . . so we . . ."
Observation 2 Students have heard the strategy shared, and either you're not sure they understand it or students need time to make sense of it.	Prompt students to rephrase key ideas, ensuring the rephrasing represents the idea initially shared and not a new idea or strategy.
Observation 3 There is an element of the strategy shared that is essential to developing understanding of the lesson goal.	Prompt a Turn and Talk that focuses students' attention on the element, then listen in as students discuss it, and select a partnership or two to make their thinking public. For example, in the conversation in Figure 7, the goal is to make a 10 to add, so the Turn and Talk is about why Maria added three and then two more.
Observation 4 Two student strategies have been shared, but the connections between them are not explicit.	Prompt a Turn and Talk that draws attention to the connections. A classic prompt sounds like, "Where do you see the numeric expression from the first strategy in the tape diagram in the second strategy?" or "What similarities do you see between the two strategies?" Of course, the representations in each strategy change, but the Turn and Talk frame is applicable whenever asking students to make connections between two strategies.
Observation 5 Students have heard the strategy, yet there are additional mathematical ideas within the strategy that the partnership omitted or there are missing links in the strategy.	Prompt students to ask questions about their classmate's solution strategy.

Some helpful tips:

- Intake is multimodal. Observe students' visual cues, like confused faces or nods of agreement. Listen for audible cues, like "Ooohhh" or "Huh?" Prompt visual cues like thumbs up or thumbs down so students can quickly communicate whether or not they agree with the idea shared.
- Often we focus on the student who is sharing, but to better intake, position yourself so you can see faces of the classmates listening.
- Pause students at key points in their explanations to prompt classmates to rephrase what's been said once (or twice!) to promote listening and check for understanding. You may do this more than once for more involved strategies.

Conclusion

When a lesson is designed around a task worthy of student thinking and discussion, there are myriad opportunities to prompt, surface, intake, interpret, decide, and enact decisions. The graphic in Figure 8 shows how the cycle appears throughout the problem-solving process, as highlighted in the Try–Discuss–Connect instructional framework.

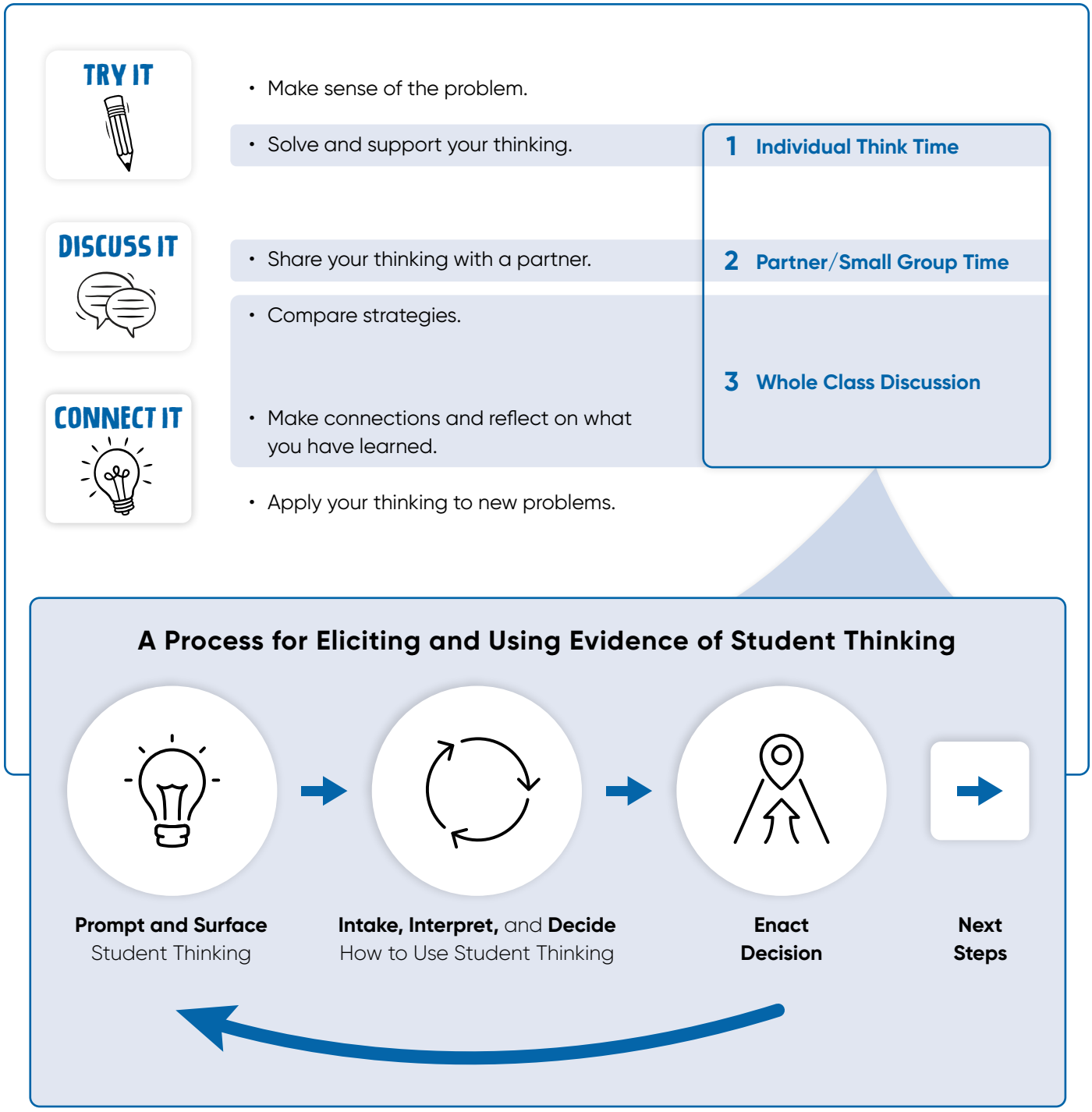

Figure 8: *The Try–Discuss–Connect instructional framework from the* i-Ready *core math program integrates practices that support the cycle for Eliciting and Using Evidence of Student Thinking.*

The Eliciting and Using Evidence of Student Thinking Cycle repeats itself multiple times during a problem-based lesson. It is used during individual think time, partner or small group time, and whole class discussions, often increasing in granularity. For instance, as you prompt a Turn and Talk, you can circulate and intake student thinking in the same manner as when you were previously intaking partner work. And as the cycle begins again—based on the Turn and Talk—you'll identify a few student ideas to share in the whole class. This cycle repeats again each time a student or partnership shares a strategy. In fact, each time we give students something to think about, we are eliciting and using evidence of student thinking following the same thought process as described in the cycle in Figures 2 and 8.

As students' understanding develops toward the lesson goal, the final decision you will make is whether students are ready to transition to independent application, are able to reflect on their learnings from the lesson, or are needing additional support. You may realize that some students would benefit from more work with the teacher in a small group before transitioning to independent work, while others are ready to apply what they have learned at the end of the lesson. In either case, it is important that students have the opportunity to work independently to apply and practice the concepts of the lesson.

The Eliciting and Using Evidence of Student Thinking Cycle repositions students' and teachers' roles within the classroom. Students will come to expect that they will be actively involved throughout the class and that their thinking will drive the discussions. Students become engaged in learning instead of being passive spectators watching the teacher do all the thinking and talking. Teachers become facilitators of student thinking rather than disseminators of knowledge. Ultimately, students are the sense makers and teachers are the decision makers. With that frame in mind, we are no longer the sole authority in the classroom. Rather, our role shifts to become filters and facilitators of mathematical ideas that come directly from our students.

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