

Effective Teaching Strategies to Promote Student Discourse



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How we will spend our time..

- Teaching and Thinking Practices
- Name 3 teaching strategies
- Engage in mathematics
- Reflect on the teaching strategies baked into the math experience
- Unpack each teaching strategy and how to implement it

Engaging Students in Mathematical Thinking

“

“We are currently preparing students for jobs that don’t yet exist . . . using technologies that haven’t yet been invented . . . in order to solve problems we don’t even know are problems yet.”

”

—*The Jobs Revolution* Richard Riley

Engaging Students in Mathematical Thinking

Standards for Mathematical Practice (CCSS, 2010)

Mathematically proficient students:

- 1.** Make sense of problems and persevere in solving them
- 2.** Reason abstractly and quantitatively
- 3.** Construct viable arguments and critique the reasoning of others
- 4.** Model with mathematics
- 5.** Choose appropriate tools strategically
- 6.** Attend to precision
- 7.** Look for and make use of structure
- 8.** Look for and express regularity in repeated reasoning

Engaging Students in Mathematical Thinking

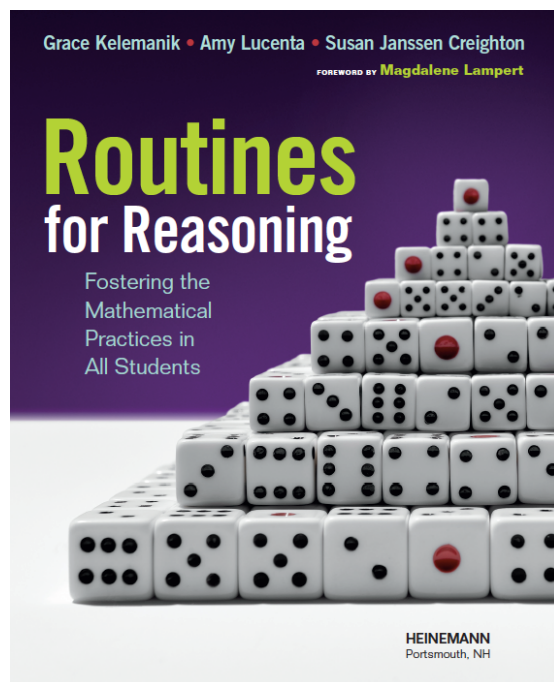
NCTM Teaching Practices (NCTM, 2014)

Effective mathematics educators:

- 1.** Establish mathematical goals that focus learning
- 2.** Implement tasks that promote reasoning and problem solving
- 3.** Use and connect mathematical representations
- 4.** Facilitate meaningful mathematical discourse
- 5.** Pose purposeful questions
- 6.** Build procedural fluency from conceptual understanding
- 7.** Support productive struggle in learning mathematics
- 8.** Elicit and use evidence of student thinking

Instructional Routines Develop Practices

- Mathematical *Thinking* Practices
- Mathematical *Teaching* Practices



“Instructional routines are meant to be repeated, and this repetition makes them very effective vehicles for developing mathematical practices.”

(Kelemanik, Lucenta, Janssen Creighton, 2016)

Effective Teaching Strategies to Promote Student Discourse



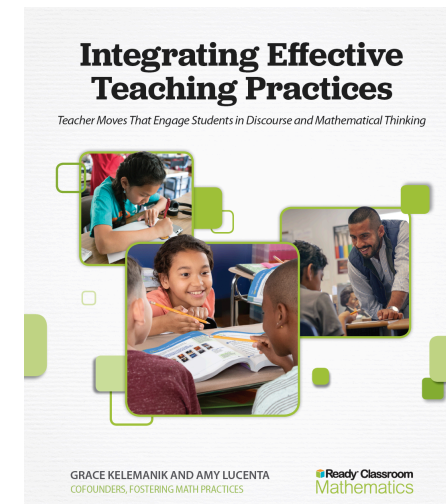
Individual
Think Time



Turn
and Talk



4 Rs



What's an Instructional Routine?

“... designs for interaction
that organize classroom
activities.”

(Lampert, NCSM 2015)

Try–Discuss–Connect Routine

Try It

Make sense
of the problem.

Solve and support
your thinking.

Discuss It

Share your thinking
with a partner and the
whole class.

Compare
class strategies.

Connect It

Make connections
between strategies.

Apply your thinking
to new problems.

Try–Discuss–Connect



TRY IT

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



DISCUSS IT

- Share your thinking with a partner.
- Compare class strategies.



CONNECT IT

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



TRY IT Make sense of the problem

- What is the problem about?



TRY IT Make sense of the problem

**Perez has 205 flower seeds.
He plants 137 seeds.**

- What are you trying to find out?



TRY IT Make sense of the problem

**Perez has 205 flower seeds.
He plants 137 seeds.**

- What information is important?



TRY IT Solve and support your thinking

**Perez has 205 flower seeds.
He plants 137 seeds.
How many flower seeds
does Perez have left?**



Math Toolkit

- base-ten blocks
- place-value charts
- number lines



DISCUSS IT

Share your thinking with a partner



Ask your partner: Do you agree with me? Why or why not?

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



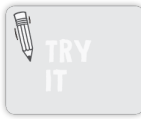
DISCUSS IT

Compare class strategies

Perez has 205 flower seeds.

He plants 137 seeds.

**How many flower seeds
does Perez have left?**



DISCUSS IT Compare class strategies

**Perez has 205 flower seeds.
He plants 137 seeds.
How many flower seeds
does Perez have left?**

$$205 \quad 137$$

$$205 - 5 = 200$$

$$137 + 3 = 140$$

$$200 - 140 = 60$$

$$60 + 8 = 68$$

$$5 + 3 = 8$$

$$68$$



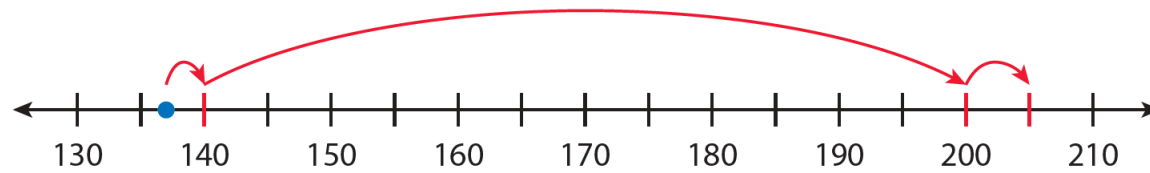
DISCUSS IT Compare class strategies

**Perez has 205 flower seeds.
He plants 137 seeds.
How many flower seeds
does Perez have left?**

$$140$$
$$200$$
$$137 + 3 + 60 + 5$$
$$68$$



MODEL IT Compare strategies

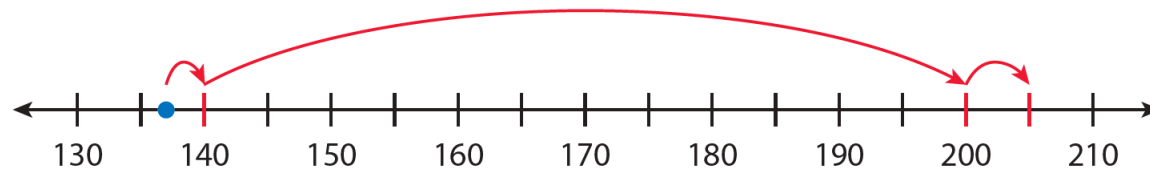




MODEL IT Compare strategies

You can use a number line to add on to find a difference.

You can also solve the problem with the addition equation $137 + \square = 205$.
Use a number line to add on to 137 to get to 205.



Find the numbers that you add to get to the next number:

$$137 + \mathbf{3} = 140$$

$$140 + \mathbf{60} = 200$$

$$200 + \mathbf{5} = 205$$



CONNECT IT

Make connections and explain your thinking

Now you will use the problem from the previous page and a place-value chart to help you understand how to add on to subtract.

- 1 Start at 137. What is the next ten?
How many ones do you add to get to the next ten?
This first number is written in the chart for you.

	Hundreds	Tens	Ones	
137 +			3	= 140
140 +				= 200
200 +				= 205

- 2 How many tens do you add to get from 140 to the hundred you need?
Write your answer in the chart.
- 3 Now what do you add to get from 200 to 205? Write your answer in the chart.
- 4 Write an addition equation to show what you added.

How many flower seeds does Perez have left? seeds

- 5 Explain how you would add on to find this difference: $202 - 195$.



CONNECT IT

Reflect on what you have learned

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model It**. Which models or strategies do you like best for subtracting three-digit numbers? Explain.



APPLY IT

Apply your thinking to a new problem

7

Edith has \$600. She spends \$84. How much does Edith have left? Show your work.

**APPLY IT****Apply your thinking to a new problem**

8 Find the difference between 430 and 182.

- Ⓐ 148
- Ⓑ 240
- Ⓒ 248
- Ⓓ 310

When and how do these 3 teaching strategies promote student discourse in Try-Discuss-Connect?



**Individual
Think Time**



**Turn
and Talk**



4 Rs

Try-Discuss-Connect Routine

includes Individual Think Time, Turn and Talk, and the Four Rs



Try It

**Make sense of the
problem**

**Solve and support
your thinking**



Discuss It

**Share your thinking with a
partner and the whole class**

Compare class strategies



Connect It

Make connections

**Apply your thinking to
new problems**

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Try It

Make sense of the problem

 Four Rs

Solve and support your thinking


 Individual Think Time



Discuss It


Share your thinking with a partner and the whole class

 Four Rs

 Turn and Talk

Compare class strategies

 Four Rs


 Turn and Talk




Connect It

Make connections

 Four Rs

 Turn and Talk

Apply your thinking to new problems

 Individual Think Time



Individual Think Time



What?

Time for students to think or work privately before discussing with a partner, a small group, or the whole class



Why?

To allow students to make sense of the question or problem, begin to gather their thoughts and questions, and significantly increase both the quantity and quality of student talk and engagement in the thinking

How do you launch Individual Think Time?



- Explicitly prompt Individual Think Time
- Time Individual Think Time purposefully

Example: “I’m going to project a strategy someone else used. Take some individual think time to make sense of their approach.”

When do you use Individual Think Time?



Before a teacher poses a question to the class.
(Ever see a teacher ask a question and only 2 students raise their hand?)



When a student puts their work on the board or under a document camera.



Before students work with partners to solve a problem.

Best Practices of ITT



Getting Started with Individual Think Time:

- ✓ **Consider when students will need to make sense of questions, representations, strategies, or worked examples during a lesson, and how much time students will**

Craft a prompt for ITT that will remain consistent. (Example: “Take a moment to think by yourself” or “We’ll start with private think time.”)

- ✓ **Design a reminder for yourself to prompt the ITT.** For example, build an icon into your slide deck, or put a sticky by the document camera that you use to project student work.
- ✓ **Pay attention to the timing of ITT.** Consider, what happens when you cut think time too short? What is the effect when you provide longer ITT? Adjust accordingly.
- ✓ **Share with students that taking time to think and process information is a practice that many people use, especially mathematicians.** You may want to share an example from your life, such as how you and the other teachers take time to process ideas before you discuss them in staff meetings.

Individual Think Time CAUTIONS



Launching ITT but then continuing to give directions or

Allowing students to raise their hands as soon as they have a response or idea. Other students may be anxious that they are not thinking quickly enough and give up. Have students wait until you ask students to respond to the question.

Supporting students with their thinking. This is NOT the time to differentiation instruction or step in to provide personalized attention.



Supporting students with their thinking. This is not the time to differentiate instruction or step in to provide personalized attention. Allow students time to think and persevere.



Turn and Talk



What?

An opportunity for students to work out ideas and language together



Why?

So that each and every student has an opportunity to speak, develop language and thinking, and so that the teacher can hear from many students



How?

Provide a purpose, prompt, and product

Which prompt will foster discussion among students? Why/ why not?



1. Take 30 seconds to talk with your partner about what you heard
2. Will Olivia's strategy always work? Turn and talk to your partner so that, together, you can decide if you think it will always work and justify your decision
3. What is 6 times 8? Turn and talk to your partner.

Which prompt will foster discussion among students? Why/ why not?



Will Olivia's strategy always work? Turn and talk to your partner so that, together, you can decide if you think it will always work and justify your decision

Purpose: Make sense of Olivia's strategy

Prompt: "Will Olivia's strategy always work?"

Product: make a decision and justify your answer

When do you use Turn and Talks



You ask a question and no one raises their hand.

OR

You ask a question and a lot of students raise their hand.



When a student has shared something really key to the lesson and you want to reinforce what was said and have students explain an idea.



When the teacher wants to get a sense of what students are thinking or their level of understanding before moving on.



When the teacher needs time to determine his or her next move.

Best Practices of Turn and Talk



Assign which partner will begin talking. Example: If you are sitting closer to the window, you will share first.

and Talks might focus on the why, when, and how of regrouping.)

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 use "I knew...so I..."
Partner 2 use "I agree/disagree with you because..."
Then switch.

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...")



Repeat, Rephrase, Reword



What?

Repeat, Rephrase, Reword, Record



Why?

To process and refine mathematical ideas and language and get students listening to one another.



How?

- Prompt students to *Repeat, Rephrase, or Reword*.
- Ensure students repeat, rephrase, reword.
- Record important language and ideas.

Without the 4Rs



Maria:

I added three and then added 2 more to get 12. (in a soft voice)

Teacher:

So Maria added three to make a 10 and then added 2 more to get 12.

Teacher:

Who else did the problem like Maria?

With the 4Rs.



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

Teacher: Who can say what Maria said, because I'm not sure everyone heard?

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

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

Julia: "She started by adding three and then added two more to get 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 2 more and got **a sum** of 12".

Teacher: Turn and talk to your partner. Why do you think Maria added 3 and then 2 more? Come up with at least one possible reason.

How do you use the 4Rs?



If it's possible that not everyone heard a response...



...then the teacher has one or two students **repeat** what was said.

If

- the idea is a key part of the lesson, **or**
- The teacher wants to check to see if students understand what was said, **or**
- The teacher isn't sure what a student has responded...



...then the teacher has a few students **rephrase** the idea using different words.

How do you use the 4Rs?



If there is specific language students can use to express this idea more precisely...



...then the teacher prompts students to **reword** the idea using more precise language.

If there are important ideas, words, or images being shared that students would benefit from seeing visually...



...then the teacher should **record** these ideas to help students process or remember key concepts and participate in the conversation.

Best Practices for the 4Rs



Getting Started with the Four Rs

When planning for a class discussion, anticipate the ideas students will share, and

✓ **Start having students repeat and rephrase.** After an idea is shared, ask one student to repeat the idea, then ask another student to rephrase the idea. Some suggestions for ways to ask students to repeat or rephrase include:

- ▶ *"Who can share what they think they heard Alicia say?"*
- ▶ *"What did Zack just say?"*
- ▶ *"I don't think the people in the back heard that. Who can repeat what Sharice said so that everyone can hear?"*
- ▶ *"What is another way we could say what Morgan said?"*

- ▶ *"What did Zack just say?"*
- ▶ *"I don't think the people in the back heard that. Who can repeat what Sharice said so that everyone can hear?"*
- ▶ *"What is another way we could say what Morgan said?"*

4Rs Cautions



Common Pitfalls when Teachers Implement the Four Rs

The teacher repeats or rephrases the idea instead of prompting students to process the idea. If the teacher does this regularly, students learn that they do not have to listen to each other.

rather than engaging the student's classmates. The repeating, rephrasing, and rewording should come from students who are making sense of the ideas, not the originator of the idea.

- ✗ **Prompting the students to reword prematurely.** It is difficult to reword an idea with more precision when the idea is not yet clear in your mind. It is hard to communicate something you are struggling to make sense of, particularly if it is in a language you are not yet comfortable using. Therefore, hold off on prompting a reword until most/all students understand the idea.
- ✗ **Falling into the trap of explaining when you are recording.** The role of the teacher when recording is to provide a visual support of student thinking—not to explain and take over student thinking.



Questions?

For More on Reasoning Routines

Reach Out

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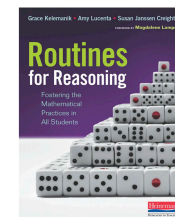


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