Reveal MATH®

Let's Talk About Math!

The Teacher's Blueprint for Meaningful Conversations

MA24 M 24473

Implementation Support

Meaningful Discourse Builds Language and Understanding

This guide provides a framework for engaging students in discussions focused on problem solving through metacognition, analyzing errors and mistakes, and synthesizing their existing knowledge to deepen their mathematical understanding. This guide also provides support for teachers to:

- Ask questions that cause students to introspectively focus on the 'what' and 'how' of their thinking processes.
- Support students in mathematical sense making.
- Engage students in collaborative conversations throughout the lesson.
- Promote thinking, speaking, listening, and sharing language.
- Make student thinking visible.
- Create an avenue for students to cultivate an awareness of and effectively express their thoughts.

Introduce–Talk–Connect Discourse Framework

Introduce

Make conversations and problems accessible to all students by asking questions that cause students to **think** about what they already know.

Talk

Engage students in exploring, discovering, and investigating concepts by asking questions that cause them to **reflect on and analyze** thinking and reasoning.

Connect

Support students in summarizing, evaluating, and synthesizing learning by asking questions that **extend their understanding and bridge connections** to concepts and language.

Discourse Framework Can Be Integrated Into Your Lesson Model

Use the **Introduce–Talk–Connect Discourse Framework** to support class discussions. See the example of how it can map onto your existing lesson structure.

Introduce

Lesson Begins (E.g., Launch, Getting Started, Anticipatory Set)

Talk

Teaching/Learning Activities (E.g., Focus Lesson, Discovery, Whole Group)

Connect

Concept Summary/ Assessment (E.g., Reflection, Practice, Journals, Exit Ticket)

Implementation Support

Build Confidence and Capacity

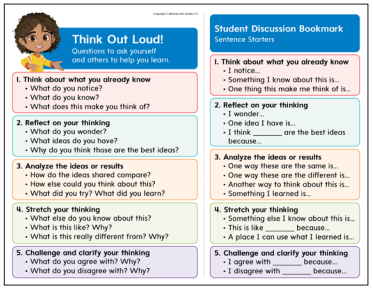
Use strategies to build student confidence and capacity with discourse.

- Pose questions and have students talk with a neighbor before sharing.
- Have students pass the question after answering it to another student to add onto their response or provide a new one.
- Have students retell what they heard someone else say.
- Have students begin their response by responding to something that was already said.
  - I agree with _____ because...
  - I disagree with _____ because...

Sentence Starters

Provide students with sentence starters that give them entry points into class discussions.

- I would like to add to what _____ said...
- What I heard _____ say was...
- This makes me think of...
- I like what _____ shared because...
- A question I have about this is...
- Can you clarify what you meant when you said...
- I find this idea interesting because...
- I would like to hear more about...



See pages 11-13 for more resources.

Build Discourse Practices

Non-Verbal Communication

Great for: K-2 students, students developing academic language, classrooms with multilingual learners

- Use thumbs up (agree), thumbs down (disagree), thumbs sideways (unsure).
- Use fingers to vote to show the strategy they want to try, the solution they think is correct, their level of certainty about a topic, etc.
- Students stand up (e.g., agree), turn around (e.g., I have different idea), sit down (e.g., disagree).

Writing

Great for: Quiet students, classrooms with over-talkers

- Students write down their thoughts before sharing.
- Pause at various points of the discussion and have students write one-sentence summaries of what they're learning.
  - After each pause, students add to their summary.
  - At the end pair students to share and revise their summaries before sharing with the class.

Respectful Debates

Great for: 3-8 students, classrooms focused on engaging students in analysis and evaluation of ideas

- Use sentence starters to support respectful debate.
  - I understand your point, but I think...
  - I believe...
- Students back up their points with examples or non-examples.
- When sharing with a partner, students convince their partner why their idea or strategy is best.

Introduce–Talk–Connect Discourse Framework

Teacher support for engaging in student-led discussions.

Introduce

Focus questions on what holds significance in the problem or conversation, how it relates to what they know, and how students are making meaning of it.

Sample questions:

- What do you notice?
- What do you wonder?
- How does this relate to something else you know?
- What does this mean to you?
- When have you solved problems like this before?
- What problem are you solving?

Talk

Focus questions on evaluating reasoning, comparing approaches and points of view, and learning from mistakes.

Sample questions:

- How are you organizing your thinking?
- How will you start?
- What does a reasonable solution look like?
- What ideas do you have?
- What do you think about what has been said?
- What is your strategy?
- Do you agree? Do you disagree?
- What might you do differently?
- What did you learn?
- How does this compare to how you were originally thinking?
- How is what you did the same as _____(student)? How is it different?

Connect

Focus questions on supporting communication, generalizing understanding, connecting to larger mathematical ideas, supporting language development, and applying knowledge to unfamiliar scenarios.

Sample questions:

- How do you plan to apply what you learned? How does this help you?
- How did the discussion cause you to revise your answer/thinking?
- What is another way you can solve the problem?
- What did you already know that helped with the problem/discussion?
- How are these ideas/strategies related?
- How does what you have learned connect to other things you know?
- What is an example and a non-example?
- What would happen if _____?
- When would this not work?
- What else can you tell me about _____?

Discourse Strategies

Strategies that can be used during instruction to get students talking.
Focus on student-to-student conversation with the teacher acting as a facilitator.

Think, Pair, Share

- The teacher poses a question and gives students time to think about it individually.
- Students get with a partner.
- One person listens as the other shares their thoughts for 2 minutes.
- After 2 minutes they switch roles. Once they have both shared, they again switch roles and repeat the process and respond to what the other has said.
- Each student gets 1 minute to respond. After both partners share, the teacher has some students share their thoughts with the class to further the discussion.

What do You Choose?

- Post signs around of the room that say “Strongly Agree,” “Agree,” “Disagree,” or “Strongly Disagree.”
- The teacher poses a statement or question to the class. Students go stand under the sign that describes their reaction to the statement or question.
- Once students have made their selections, give them a few minutes to talk to the other students around them to explain their thinking.
- After each group has time to discuss, have a representative of each group share their reasoning.
- As students share, allow the students to move into different areas if they change their mind based on the reasoning given. If students move to different groups, have them explain why.

Variation: Signs could say True and False. Signs could be multiple choice - use A, B, C, or D. Signs could say I have a strategy, I am still thinking, I need more information.

Stop, Think, and Share

- During instruction, pause and tell students to stop and think about something they have learned.
- Ask students to share something that explains what they have learned, something they are confused about, a wonder they have about the content, a new idea or strategy, or a comment they want to make.
- Call on different students to “Stop, Think, and Share” and be sure to give the rest of the class time to respond to what was said.

Variations: Stop, Think, and Write or Stop, Think, and Draw

Word Wave

- At any point in the lesson, the teacher will pose a question or statement like:
  - What stands out to you about what you heard?
  - How are the responses from your classmates similar/different to your response?
  - What responses do you wonder about?
- Students will think of one word or phrase that summarizes their response.
- Students will share their responses rapidly in specified order. There should be no discussion at this point.
- Once everyone has shared, the teacher can engage students in a discussion about what was shared.

Discourse Strategies (continued)

5 Sentence Summary

- In groups, have students discuss a question that was posed or their reflection of the lesson.
- Students work in a group to write five sentences that summarize their thoughts on a question posed by the teacher, the discussion of a topic during instruction, or a description of what was learned in the lesson.
- After each group creates their summary, the whole group will share and discuss.

Variation: Decrease the number of sentences. Ex: 1 or 3 Sentence Summary.

Beach Ball Toss

- Use a small beach ball.
- Pose a question to the class.
- Toss the ball to a student for a response.
- After the response, that student poses a question and tosses the ball to another student. This repeats at the teacher's discretion.

Variation: Put numbers 1-6 on the ball. Write six questions or sentence prompts on the board. When students catch the ball, they must answer the question or complete the sentence prompt that corresponds to the number their right thumb is closest too.

Graffiti Wall

- Create a graffiti wall using a bulletin board, large sheet of paper, or whiteboard. In the center of the graffiti wall write a math concept.
- Have students use a marker to write or draw what they know about the topic.
- Allow students to add to the topic during the rest of the unit on that topic.
- You may want to pose specific questions on the graffiti wall for students to respond to.
- Discuss the content on the wall with the students. Have them share if they agree/disagree with the content on the wall.

Roll it

- Write six open ended questions on the board or chart paper.
- Place the students in groups. Give each group one die or pass around a die.
- Have them roll the die one time.
- Each person in the group discusses the question that corresponds to the number rolled.
- (Note: They should all be answering the same question.) This is a great way to give students an opportunity to justify their thinking, to make claims and to hear other perspectives.

Discourse Strategies (continued)

Brain Dump

- Have students write down their thoughts of a given topic/problem/question. (They are dumping out their brain).
- Encourage them to write questions if they have them.
- The purpose is to get students to think about the thoughts they have related to a particular topic/task/problem or question.
- Once students have dumped their brains, have them share their thoughts with a partner or small group.
- The will allow the students to hear other perspectives and gain additional information to help them respond to the topic, solve the problem, engage in the task or answer the question.

Share One, Get One

- Give students a piece of paper. Have students divide their papers in fourths.
- Students will write two things they learned, ideas, questions, tips, or a-ha's in the top two fourths of the paper.
- Students will then move around the room to find two people who have 2 different things written. After sharing with their classmates, students copy the new statements, facts, etc. onto their paper and include the name of the student who shared it with them.

3–2–1 + 1

- Have students fold a piece of paper into fourths. This can either be done at the start or at the end of a lesson.
  - In the top right they will write three things they learned.
  - In the top left they will write two questions they have or 2 things they want to know more about.
  - In the bottom right they will write one wonder, worry, or wow they have about what they have learned.
  - Students will leave the bottom left space blank.
- Place students in small groups or pairs to discuss their 3–2–1.
- Encourage students to revise or add additional thoughts to their 3–2–1 based on the discussion.
- At the conclusion of the small group/pair discussion have students write one key learning or take away from their discussion in the bottom left box.
- Bring the class together to summarize the new learning from each group.

This is my Favorite

- Using homework, an activity students completed, or a problem they have solved, ask students to identify their favorite thing about the work they did or the math they solved.
- Place students in pairs and have them share their favorites.
- Have them discuss the similarities and differences between their favorite parts and that of their partner.
- Bring the class together for a discussion and ask students how their favorite parts that were shared can help them be successful in upcoming work/lessons.

Discourse Strategies (continued)

Two Truths and a Lie

- Write three statements on the board about a math concept.
- Two of those statements should be true and one should be false.
- Have students engage in discussions trying to determine which statement is false.
- Encourage students to provide examples as their evidence.
- Challenge students to convince their classmates of their point of view.

Variation: Provide two examples and one non-example.

Pass the Question

- Pose a question to the class that has multiple answers (e.g., How would you summarize today's lesson? How would you describe (vocabulary word)? What is an example or non-example? How would you solve this problem?)
- One student begins by answering the question then asks the same question of another student.
- Students continue to "pass the question" until everybody in their group (or a pre-selected number of students if it is being done whole group) has an opportunity to answer the question.
- Have students write a summary of what they heard.
- Discuss the responses as a class.

State Your Claim

- Pose a problem to the class. Have students make sense of the problem and plan how they would solve it. (They are not to solve the problem).
- Have students write their claim on a piece of paper (which would be their strategy for solving the problem), their evidence (how do they know this strategy will provide the correct solution), and their reasoning (why is this the best way to solve the problem).
- Have one student state their claim, evidence, and reasoning. Engage in a class discussion. How does this claim compare to their claim? How does the reasoning compare? Do students agree or disagree?
- Allow time for students to share different claims before solving the problem.

When doing this for the first time you may want to provide the first claim or use a "fake student" to get students comfortable discussing and comparing their reasoning to that of their classmates.

Doing Good, Getting Better, and Still Questioning

- At the conclusion of a lesson or discussion have students reflect on what they have learned.
- After giving think time, have students complete the following sentences.
  - "I am doing good or I am understanding..." (describe what they learned or understand better as a result of the lesson)
  - "I am getting better at..." (describe what they are working toward understanding).
  - "I am still questioning..." (describe something they are still wondering about).
- After students have shared, have students elaborate on what they shared.
- Have students respond to something they heard that they
  - relate to
  - wonder about
  - agree with
  - can provide an answer to or an example of

Implementation Progression for Discourse

	Novice	Intermediate	Advanced

Teacher	• Integrate the **Introduce–Talk–Connect** Framework into your lesson structure.
	• Identify 2 questions for each part of the **Introduce–Talk–Connect** Framework and ask those questions each time. Once you are comfortable add additional questions.
		• Discuss reasoning and learning from mistakes.
		  • Ask students to share their thinking about things that didn't work, what they learned from it, and how it will help them.
		  • Answer student questions with a question that promotes their thinking.
			• Have students discuss their ideas and strategies with a partner. Encourage students to convince their partner that their idea or strategy is best.
			• Try starting class with a problem that you solved incorrectly. Have students discuss why the problem is incorrect and what your reasoning might have been. Have them discuss in small groups how they would suggest you revise your thinking to correct your mistake.

Student	• During discourse, have students start each of their conversations with one of the following:
	  • "I agree because…"
	  • "I disagree because…"
	  • "I am not sure because…"
	• When asking a question, give all students 5 minutes to write their thinking before engaging the class in discussion.
		• Promote student-to-student discourse by requiring 2-3 students to contribute to the conversation before you speak.
		• During class discussions, have students use the **Student Discussion Bookmark** to begin their sentences.
			• Have students use the **Think Out Loud!** poster during discussions.
			  • They can add new thoughts to the conversation.
			  • Students can also pose clarifying discussion questions.

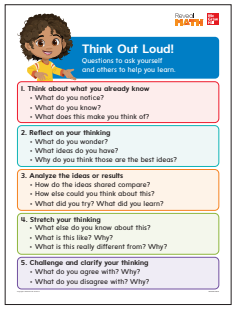
Content	• Select 1 discourse strategy and use it at least one time every week during your lesson. Once you are comfortable with that one, add an additional strategy and rotate between the two.	• As students listen to classmates share their work they will select a sentence starter from the **Student Discussion Bookmark** to comment on what they heard.	• When students are sharing their work have them share what they did and why they did it.
			  • As the class listens have them compare their thinking to what they heard from their classmates.
			  • Have the class respond by saying "my strategy is similar," or my strategy is different…"

Tips for Creating a Discourse Culture

Build Confidence and Capacity

- Discuss with students why it is important to share their ideas and listen to the ideas of their classmates.
- Ask students to identify how they know someone is listening to them.
- Have students think about classroom norms that are important to follow when having a discussion.
- Write down all the ideas students say and discuss.
- Work together to come up with 3-5 norms that students will follow during discussions.

Teaching Students the **Art of Discussion**



Materials: Think Out Loud! poster, Student Discussion bookmark, interesting picture or rich math problem (should be a review concept so the focus can be on learning to engage in discourse).

- Provide each student with a bookmark. Ensure the poster Think Out Loud! is located where it is clearly visible to the students.
- Pose the problem or show the image. Tell students "think about what you already know." Model asking the questions from the poster under the related category.
- Have students write their answer to the question using the sentence starter from their bookmark under that category.
- Pose the question again and have students respond. Some students that are not comfortable may read their responses. Encourage them to listen to their classmates answers and use their responses to add to or provide a different perspective.
- Repeat using the other categories.
- The goal is to get students comfortable joining the discussion and making it more like a conversation.
- Eventually students should feel comfortable enough asking the questions on the poster of their classmates to help clarify their thinking.

Avoiding the Starburst

A Starburst is when discourse in the classroom follows a teacher to student back to teacher format. To avoid this, use a three before me protocol during discussions.

Three Before Me Strategy

- Once the teacher poses the question and it is answered by the first student, two other students will have to add to the discussion before it can go back to the teacher.
- Encourage students to use sentence starters like "I agree/disagree..." or "I want to add to what was said..."

Discourse as Formative Assessment

Discourse is a formative assessment practice embedded in instruction that informs both students and teachers. Discourse makes student thinking visible and provides the opportunity for students to analyze, evaluate, and synthesize their ideas and the ideas of others. Support the use of discourse as a formative assessment.

- Have students grapple out loud as they work through their thoughts and understandings. They may say something like, "At first I thought ____ but now I think _____ because..."
- Encourage students to actively listen as their classmates are sharing and allow them the opportunity to revise their thinking.
- Use strategies such as "What do you choose?" to see what students initially know and how those ideas become shaped through discussion.
- Use a Socratic Seminar to discuss a rich problem in mathematics class.
- Encourage students to use the Think Out Loud! questions to help clarify their thinking and that of their classmates.

Think Out Loud!

Learn by asking questions.

1. Think
- What do you know?

2. Reflect
- What ideas do you have?

3. Analyze
- What did you learn?

4. Stretch
- What else do you know about this?

5. Challenge
- What do you agree with?
- What do you disagree with?

Student Discussion Bookmark

Sentence Starters

1. Think
- I know...

2. Reflect
- My idea is...

3. Analyze
- I learned...

4. Stretch
- Something else I know about this is...

5. Challenge
- I agree with _____ because...
- I disagree with _____ because...

Think Out Loud!

Questions to ask yourself and others to help you learn.

1. Think about what you already know
- What do you notice?
- What do you know?
- What does this make you think of?

2. Reflect on your thinking
- What do you wonder?
- What ideas do you have?
- Why do you think those are the best ideas?

3. Analyze the ideas or results
- How do the ideas shared compare?
- How else could you think about this?
- What did you try? What did you learn?

4. Stretch your thinking
- What else do you know about this?
- What is this like? Why?
- What is this really different from? Why?

5. Challenge and clarify your thinking
- What do you agree with? Why?
- What do you disagree with? Why?

Student Discussion Bookmark

Sentence Starters

1. Think about what you already know
- I notice...
- Something I know about this is...
- One thing this make me think of is...

2. Reflect on your thinking
- I wonder...
- One idea I have is...
- I think _____ are the best ideas because...

3. Analyze the ideas or results
- One way these are the same is...
- One way these are different is...
- Another way to think about this is...
- Something I learned is...

4. Stretch your thinking
- Something else I know about this is...
- This is like _____ because...
- A place I can use what I learned is...

5. Challenge and clarify your thinking
- I agree with _____ because...
- I disagree with _____ because...

Think Out Loud!

Questions to ask yourself and others to help you learn.

1. Think about what you already know
- What do you notice?
- What do you already know about this?
- What do you know that is related to this?

2. Reflect on your thinking
- What do you wonder?
- What ideas or strategies do you have?
- Why do you think those are the best ideas or strategies?

3. Analyze the ideas or results
- How do the ideas shared compare?
- What are other ways we can solve this problem or think about this idea?
- What did you learn?

4. Stretch your thinking
- What else do you know about this topic?
- How does this relate to other things you have learned?
- How might you use this in the future?

5. Challenge and clarify your thinking
- What do you agree or disagree with? Why?
- What would happen if _____?
- How could you think about this differently?
- What example or non-example can you share to clarify your thinking?
- Based on what you heard would you like to revise your thinking? Why?

Student Discussion Bookmark

Sentence Starters

1. Think about what you already know
- I notice...
- Something I already know about this is...
- One thing this makes me think of is...

2. Reflect on your thinking
- I wonder...
- One idea I have is...
- I think _____ are the best ideas because...

3. Analyze the ideas or results
- One way these ideas are the same is...
- One way these ideas are different is...
- Another way to solve this would be to...
- Another way to think about this is...
- Something I learned is...

4. Stretch your thinking
- Something else I know about this topic is...
- This is like _____ because...
- One place I will use what I learned is...

5. Challenge and clarify your thinking
- I agree/disagree with _____ because...
- I wonder what would happen if...
- I am thinking about it differently. My thinking is...
- I would like to share an example to help explain. My example is...
- I would like to share a non-example to help explain. My example is....
- I changed my mind because...

Think Out Loud!

Questions to ask yourself and others to help you learn.

1. Think about what you already know
- What do you notice?
- What do you already know about this?
- What do you know that is related to this?

2. Reflect on your thinking
- What do you wonder?
- What ideas or strategies do you have?
- Why do you think those are the best ideas or strategies?

3. Analyze the ideas or results
- How do the ideas shared compare?
- What are other ways we can solve this problem or think about this idea?
- What did you learn?

4. Stretch your thinking
- What else do you know about this topic?
- How does this relate to other things you have learned?
- How might you use this in the future?

5. Challenge and clarify your thinking
- What do you agree or disagree with? Why?
- What would happen if _____?
- How could you think about this differently?
- What example or non-example can you share to clarify your thinking?
- Based on what you heard would you like to revise your thinking? Why?

Student Discussion Bookmark

Sentence Starters

1. Think about what you already know
- I notice...
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- One thing this makes me think of is...

2. Reflect on your thinking
- I wonder...
- One idea I have is...
- I think _____ are the best ideas because...

3. Analyze the ideas or results
- One way these ideas are the same is...
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- Another way to solve this would be to...
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- This is like _____ because...
- One place I will use what I learned is...

5. Challenge and clarify your thinking
- I agree/disagree with _____ because...
- I wonder what would happen if...
- I am thinking about it differently. My thinking is...
- I would like to share an example to help explain. My example is...
- I would like to share a non-example to help explain. My example is....
- I changed my mind because...