Puzzle Talks Teacher Overview

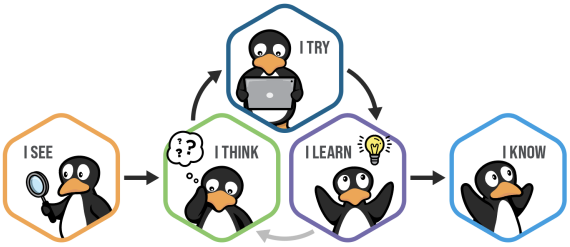
About Puzzle Talk

Puzzle Talks is the use of ST Math puzzles to engage students in mathematical discussions. Similar to number talks or math talks, the goal is to get students to communicate and deepen their understanding of mathematics.

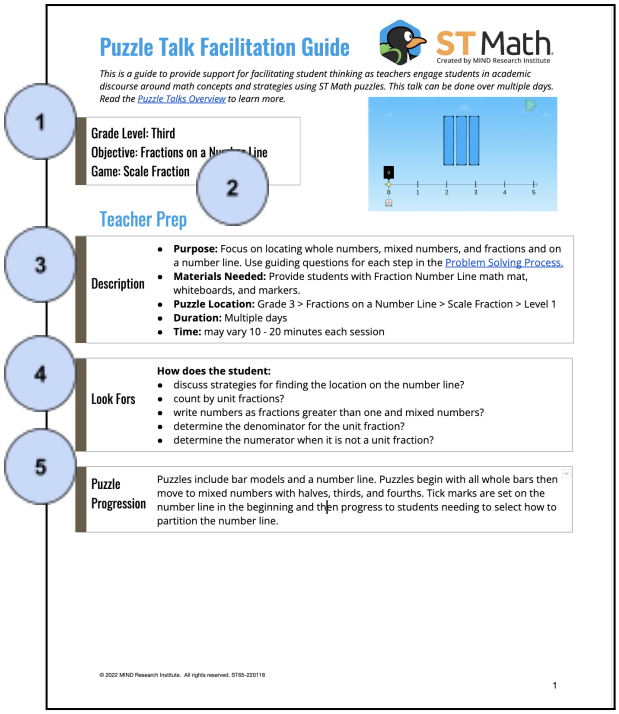
The focus of Puzzle Talk discussions should be on **following student thinking, supporting the development of strategies, and understanding of the mathematical concepts.** The goal is **NOT** to teach the puzzle, but rather to uncover, discuss, and stretch the thinking of the students as well as address misconceptions and help students make critical connections.

Easy Planning Steps

1. **Play the ST Math Puzzle**
   - ✔ Identify the math concepts being developed in the game.
   - ✔ Anticipate what strategies your students may propose.
2. **Review the Puzzle Talk Facilitation Guide**
   - ✔ Reflect on the following questions:
     - What are the key mathematical ideas to discuss/discover with the students?
     - What opportunities are there for making connections and deepening understanding of math concepts?



3. **Gather the materials for the Puzzle Talk**
   - ✔ Consider using the student bookmark to support student language development and/or the facilitation questions poster to support perseverance.



Puzzle Talk Facilitation Guide

ST Math Created by MIND Research Institute

This is a guide to provide support for facilitating student thinking as teachers engage students in academic discourse around math concepts and strategies using ST Math puzzles. This talk can be done over multiple days. Read the Puzzle Talks Overview to learn more.

1 Grade Level: Third
Objective: Fractions on a Number Line
Game: Scale Fraction

2 Teacher Prep

3 Description
- **Purpose:** Focus on locating whole numbers, mixed numbers, and fractions and on a number line. Use guiding questions for each step in the Problem Solving Process.
- **Materials Needed:** Provide students with Fraction Number Line math mat, whiteboards, and markers.
- **Puzzle Location:** Grade 3 > Fractions on a Number Line > Scale Fraction > Level 1
- **Duration:** Multiple days
- **Time:** may vary 10 - 20 minutes each session

4 Look Fors
How does the student:
- discuss strategies for finding the location on the number line?
- count by unit fractions?
- write numbers as fractions greater than one and mixed numbers?
- determine the denominator for the unit fraction?
- determine the numerator when it is not a unit fraction?

5 Puzzle Progression
Puzzles include bar models and a number line. Puzzles begin with all whole bars then move to mixed numbers with halves, thirds, and fourths. Tick marks are set on the number line in the beginning and then progress to students needing to select how to partition the number line.

1

Review the Facilitation Guide

Puzzle Talks integrate the Problem Solving Process. Use the Puzzle Talk Planner and the Problem Solving Process Teacher Facilitation Bookmark for additional support.

1. **Puzzle Information** - details the grade level, the objective, and the game's name
2. **Teacher Prep** - outlines the information in this section to help plan the Puzzle Talk
3. **Description** - provides the instructional purpose of the Puzzle Talk, materials needed, where the puzzle is located, duration, and time
4. **Look Fors** - identifies things to look for in student responses to assess understanding and drive student discourse
5. **Puzzle Progression** - gives insight into the different levels in a game to help you plan your Puzzle Talk

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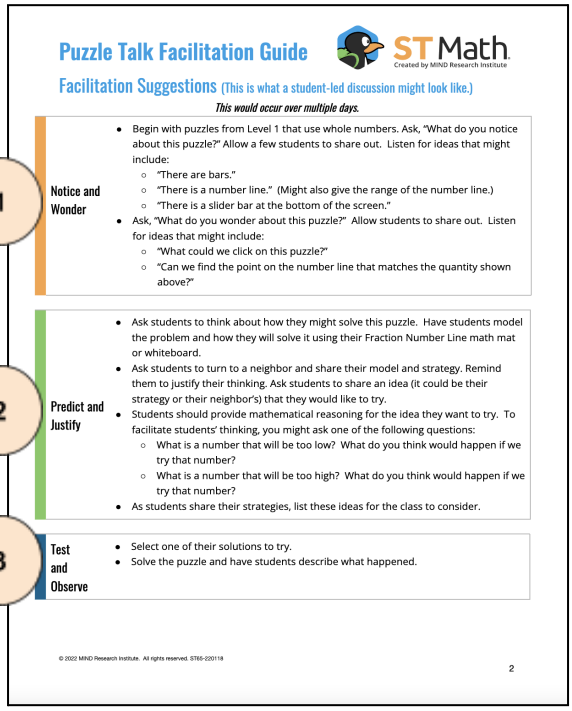
Facilitation Suggestions Sections



Puzzle Talk Facilitation Guide

Facilitation Suggestions (This is what a student-led discussion might look like.)

This would occur over multiple days.

1 Notice and Wonder

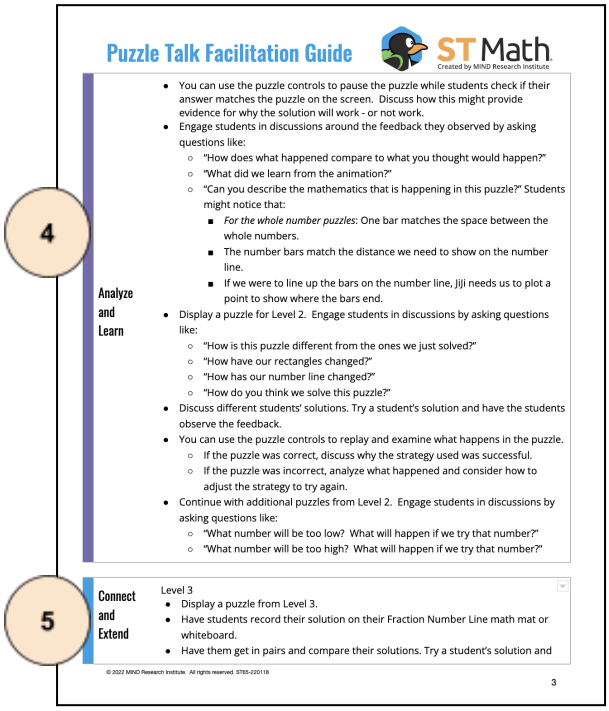
- Begin with puzzles from Level 1 that use whole numbers. Ask, "What do you notice about this puzzle?" Allow a few students to share out. Listen for ideas that might include:
  - "There are bars."
  - "There is a number line." (Might also give the range of the number line.)
  - "There is a slider bar at the bottom of the screen."
- Ask, "What do you wonder about this puzzle?" Allow students to share out. Listen for ideas that might include:
  - "What could we click on this puzzle?"
  - "Can we find the point on the number line that matches the quantity shown above?"

2 Predict and Justify

- Ask students to think about how they might solve this puzzle. Have students model the problem and how they will solve it using their Fraction Number Line math mat or whiteboard.
- Ask students to turn to a neighbor and share their model and strategy. Remind them to justify their thinking. Ask students to share an idea (it could be their strategy or their neighbor's) that they would like to try.
- Students should provide mathematical reasoning for the idea they want to try. To facilitate students' thinking, you might ask one of the following questions:
  - What is a number that will be too low? What do you think would happen if we try that number?
  - What is a number that will be too high? What do you think would happen if we try that number?
- As students share their strategies, list these ideas for the class to consider.

3 Test and Observe

- Select one of their solutions to try.
- Solve the puzzle and have students describe what happened.



Puzzle Talk Facilitation Guide

4 Analyze and Learn

- You can use the puzzle controls to pause the puzzle while students check if their answer matches the puzzle on the screen. Discuss how this might provide evidence for why the solution will work - or not work.
- Engage students in discussions around the feedback they observed by asking questions like:
  - "How does what happened compare to what you thought would happen?"
  - "What did we learn from the animation?"
  - "Can you describe the mathematics that is happening in this puzzle?" Students might notice that:
    - *For the whole number puzzles*: One bar matches the space between the whole numbers.
    - The number bars match the distance we need to show on the number line.
    - If we were to line up the bars on the number line, JiJi needs us to plot a point to show where the bars end.
- Display a puzzle for Level 2. Engage students in discussions by asking questions like:
  - "How is this puzzle different from the ones we just solved?"
  - "How have our rectangles changed?"
  - "How has our number line changed?"
  - "How do you think we solve this puzzle?"
- Discuss different students' solutions. Try a student's solution and have the students observe the feedback.
- You can use the puzzle controls to replay and examine what happens in the puzzle.
  - If the puzzle was correct, discuss why the strategy used was successful.
  - If the puzzle was incorrect, analyze what happened and consider how to adjust the strategy to try again.
- Continue with additional puzzles from Level 2. Engage students in discussions by asking questions like:
  - "What number will be too low? What will happen if we try that number?"
  - "What number will be too high? What will happen if we try that number?"

5 Connect and Extend

Level 3

- Display a puzzle from Level 3.
- Have students record their solution on their Fraction Number Line math mat or whiteboard.
- Have them get in pairs and compare their solutions. Try a student's solution and

Following the Teacher Prep page, you'll find **Facilitation Suggestions** to support teachers in delivering a Puzzle Talk. The content in the guide is meant to be used over multiple days. This section follows the Problem Solving Process using questions to help promote classroom discussions.

1. **Notice and Wonder:** ***Focus*** students' thinking on what is important, and help them make connections to prior knowledge.
2. **Predict and Justify:** ***Uncover*** students' thinking around how they plan to address the problem.
3. **Test and Observe:** ***Encourage*** students to observe and process the results of testing their hypothesis.
4. **Analyze and Learn:** ***Facilitate*** students in analyzing the feedback/results, understanding what worked and didn't work.
5. **Connect and Extend:** ***Stretch*** students' thinking and help them communicate, generalize, and connect the mathematics they have learned to their existing schemas. Additional activities are provided to deepen understanding and apply learning. These activities include pre-work which is designed to gather prior knowledge before the puzzle talk.

Tip: *Use Puzzle Talks as a 15-minute routine at the start of your math block. Use one game for the entire week to build understanding and make connections. Follow student thinking and use the models in the game as a "visual proof" to help them see the math. Bring in other ways to represent the math content so students develop an understanding of the underlying relationships and purpose of specific representations and tools.*

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Suggested Engagement Strategies to use with Puzzle Talks

Partner Talk

Have students discuss with a partner. After each partner shares their thoughts, they can compare their ideas. Challenge students to try to convince their partner to adopt their idea. This gives them time to summarize, reflect, evaluate, justify, and revise their thinking.

Voting

Have students share strategies and ideas and vote on which ones they would like to try. Have students share why they think the strategy they voted for is best. This gives them the opportunity to rate, justify their rating, and discuss the outcome.

Strategy Compare

Have students share their strategies with a partner or small group. After sharing strategies, students can make comparisons, ask clarifying questions, and determine which strategy is best for the situation and why. This gives them the opportunity to extend their thinking and evaluate others' strategies.

Popcorn Share

The teacher poses a question and calls on a student to share. That student answers and then picks another student to pass it to. They continue popcorning around answering questions, adding thoughts, and responding to their classmates. This provides an opportunity to connect and extend student thinking.

Think Pair Share

Teacher asks questions and provides individual thinking time for students. Students share their thoughts with a partner. Engage the students in a whole group sharing. This gives them the opportunity to share perspectives and ideas.

Say Something Write Something

Pause during the discussion and suddenly say, "*Say Something or Write Something!*" Have students summarize learning, as a question, make a comment, or share a new idea/strategy verbally or in writing. This provides a quick check on student understanding.