

The Language of Math: Supporting and Engaging ALL Learners

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Why is language important in math?

Let's Play a Game!

1. Find a partner or a small group.
2. One person will be given a card with a word. This person will try to get the partner or small group to guess the word without speaking.
3. The partner or small group is allowed to ask questions that can be answered with non verbal communication.

Mathematical Language

Attend to Precision CCSS.MATH.PRACTICE.MP6

- Communicate precisely to others
- Use clear definitions in discussion with others and in their own reasoning
- State the meaning of the symbols they choose

NCTM

- “It is important for all students to have opportunities to speak, write, read, and listen in mathematics classrooms, with teachers providing appropriate linguistic support and encouragement.”

NCTM Access & Equity

“An excellent mathematics program requires that all students have access to a high-quality mathematics curriculum, effective teaching and learning, high expectations, and the support and resources needed to maximize their learning potential” (Principles to Action, 2014, p. 59).

What support can the teacher provide to develop mathematical language?

Sensory Supports	Graphic Supports	Interactive Supports	Verbal and Textual Supports
<ul style="list-style-type: none">• Real-life objects or concrete objects• Physical models• Manipulatives• Pictures• Visual representations	<ul style="list-style-type: none">• Graphs• Charts• Number lines• Graphic organizer - Frayer Model	<ul style="list-style-type: none">• Whole group discussion• Small group discussion• Turn-and-talk• Cooperative learning	<ul style="list-style-type: none">• Sentence stems• Sentence starters• Word banks• Precise use of mathematical language

Culturally Responsive Teaching

- Academic Language Support
 - Academic Vocabulary
 - Revoicing
 - Scaffolding Strategies
 - Graphic Organizers

Aguirre & Zavala (2013)

Academic Language Growth

Receptive Language Skills

- Listening
- Reading

Productive Language Skills

- Speaking
- Writing

3 Act Task

Using an Inquiry Model of Teaching

- Student-centered
- Thinking/Problem Solving/Reasoning
- Teacher facilitated
- Collaboration
- Supports Productive Struggle
- Low Floor/High Ceiling
 - Access

Effective Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. 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.

Act 1: Notice and Wonder



(Jake May /The Flint Journal-MLive.com via AP, File)

Act 2:

There are 14 rows in theater. If there are 12 seats in each row, how many people can sit in the theater?

_____ rows of _____ is _____

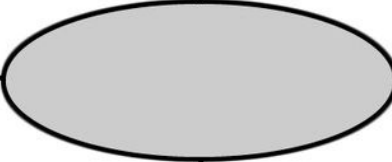
Act 3: Sharing Strategies

Exit Ticket

multiplication
area model
place value
decomposing
repeated addition

Frayer Model

Definition	Characteristics / Draw
Examples	Non-Examples

A diagram of the Frayer Model, which is a square divided into four quadrants by a horizontal and a vertical line. In the center, where the lines intersect, there is a gray oval. The quadrants are labeled: 'Definition' in the top-left, 'Characteristics / Draw' in the top-right, 'Examples' in the bottom-left, and 'Non-Examples' in the bottom-right.

Debriefing the 3 Act Task

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Decomposing a Math Lesson

What is the **academic vocabulary** in the lesson?

What **language structures** will students be able to use? (sentence stems)

What **learning strategies** will support students?

- Sensory
- Graphic
- Interactive
- Verbal
- Textual

“Whoever is doing all of the reading, writing, and talking in your classroom is doing all of the thinking.” - unknown

Thank you!

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