



BetterLesson Professional Learning Webinar

Math Language Routines



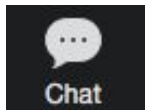
Session 2: Promoting Language Use in Math: Optimizing Output

Ohio Department of Education & Workforce

March 13th, 2024

Megan Nagel/Padraic O'Donnell

Welcome!



Share in the chat:

Where are you joining us from today?

What is your current role?

During this time of the school year, how do you give students opportunities to revise their work?

Aligned & Tailored for Ohio ESC Partnership



Aligned

Our partnership is specifically designed to amplify the impact of other state-wide infrastructure and initiatives.

Our coaches will be familiar with key efforts, including:

- Materials Matter
- HQIM-related work streams with EdReports & Instruction Partners
- Ohio Standards for Math Practice



Tailored

Our team has worked with leadership from the ESC of Central Ohio, OESCA, and the Department of Education to tailor our workshop, coaching, and learning walk content to the unique needs of ESC Math Specialists

Your Hosts



Padraic O'Donnell

Instructional Coach



Megan Nagel

Instructional Coach



Rebekah Lischwe

Instructional Coach
(Tech Support)

Let's Check In!

When do you think feedback is most effective in a math classroom?

- While completing the activity
- After completing the activity
- In a one-on-one with the teacher
- In graded assignments

Our Series: Math Language Routines



Goal

Plan to use Mathematical Language Routines as practical ways to provide multiple opportunities for students to communicate their thinking while learning mathematics

DEFINE

EXPLORE

BUILD

TRY, MEASURE, LEARN

Optimizing Output

Stronger &
Clearer Each Time

+

Critique, Correct,
& Clarify

A Plan for
Implementation

What are the Math Language Routines?

“A ‘math language routine’ refers to a structured but adaptable format for **amplifying, assessing, and developing** students’ language.”

Understanding Language/Scale
Stanford Graduate School of Education

Promoting Language *and* Content Development

SUPPORT SENSE-MAKING:

Scaffold tasks & amplify language so students can make their own meaning.

OPTIMIZE OUTPUT:

Expand opportunities for students to describe their mathematical thinking to others orally, visually, & in writing.

CULTIVATE CONVERSATION:

Increase constructive mathematical conversations (pairs, groups, & whole class).

MAXIMIZE META-AWARENESS:

Help students reflect on their own math ideas, reasoning & language.

Promoting Language *and* Content Development

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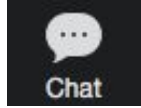
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A Tale of Two Classrooms



Make a prediction:

Which class will have higher scores on the state test and why?

Classroom A

Correct answers are king

$\frac{2}{3}$ of class is silent individual work time

Teacher grades assignments and writes feedback on the paper

Classroom B

Explaining thinking is king

$\frac{1}{2}$ of class is lively pair discussion

Teacher provides real time feedback while pairs work together

Feedback and Learning

“

“There is a positive relationship between immediate feedback and mathematics learning achievement. These findings can be used as a teacher's attention in providing feedback immediately during learning.”

Hadijah, Hadijah & Isnarto, Isnarto & Walid, Walid. (2022). The effect of immediate feedback on mathematics learning achievement.

Optimizing Output Defined

“

Students need repeated, strategic, iterative and supported opportunities to **articulate complex mathematical ideas into words, sentences, and paragraphs**. They need spiraled practice in (a) making their ideas stronger with more robust reasoning and examples, and (b) making their ideas clearer with more precise language and visuals.

Understanding Language/SCALE

Mathematical Language Routines (MLR's)



1: Stronger and Clearer Each Time

2: Collect and Display

3: Critique, Correct, and Clarify

4: Information Gap

5: Co-Craft Questions and Problems

6: Three Reads

7: Compare and Connect

8: Discussion Supports

MLR 1: Stronger & Clearer Each Time


Purpose: To provide a structured and interactive opportunity for students to revise and refine both their ideas and their verbal and written output (Zwiers, 2014). This routine **provides a purpose for student conversation** as well as **fortifies output**.

MLR 1: Stronger & Clearer Each Time

- Students think or write individually about a response
- Using a structured pairing strategy- students have multiple opportunities to refine and clarify their response through conversation
- Then revise their original written response

Throughout this process, students should be pressed for details, and encouraged to press each other for details. **Subsequent drafts should show evidence of incorporating or addressing new ideas or language.** They should also show evidence of refinement in precision, communication, expression, examples, and/or reasoning about mathematical concepts.

MLR 1: Stronger & Clearer Each Time



GOAL 1:
to be able to
clearly explain it
to others as a
mathematician

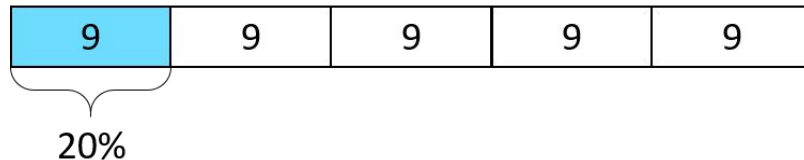
GOAL 2:
for the other
person to truly
understand the
speaker's ideas

Revisiting Jada's Puppy

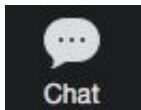
PROMPT & WRITE (1st Draft)

Jada has a new puppy that weighs 9 pounds. It is now at about 20% of its adult weight.

Here is a diagram that Jada drew about the weight of her puppy.



The adult weight of the puppy will be 45 pounds.



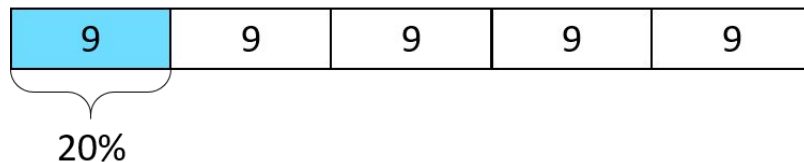
How can you see that in the diagram?

Revisiting Jada's Puppy

PROMPT & WRITE (1st Draft)

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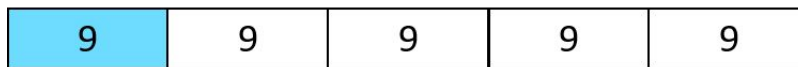
The adult weight of the puppy will be 45 pounds. How can you see that in the diagram?

I can see 45 because the five 9's equal 45.

Revisiting Jada's Puppy

PROMPT &
WRITE (1st Draft)

2 - 3
STRUCTURED
PAIR MEETINGS



20%

I wrote "I can see 45
because the five 9's
equal 45."



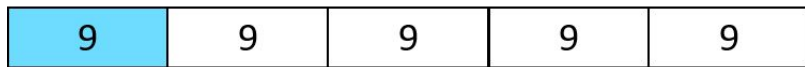
"Why are you sure
that... (the adult
weight is 45)?"



Revisiting Jada's Puppy

PROMPT &
WRITE (1st Draft)

2 - 3
STRUCTURED
PAIR MEETINGS



20%

Why did you describe
(the puppy's weight)
as... ($\frac{1}{5}$)?

I wrote "9 is $\frac{1}{5}$ of 45."

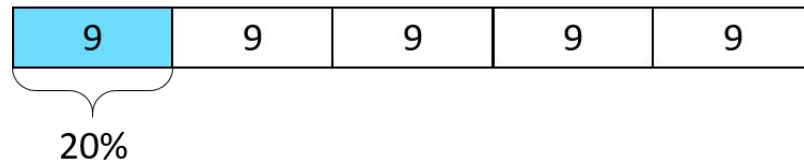


Revisiting Jada's Puppy

Jada has a new puppy that weighs 9 pounds. It is now at about 20% of its adult weight.

**PROMPT &
WRITE (1st Draft)**

Here is a diagram that Jada drew about the weight of her puppy.



**2 - 3
STRUCTURED
PAIR MEETINGS**

The adult weight of the puppy will be 45 pounds. How can you see that in the diagram?

**WRITE
(2nd Draft)**

1st Draft: I can see 45 because the five 9's equal 45.

2nd Draft: The puppy is $\frac{1}{5}$ of its adult weight because the whole is divided into 5 pieces of equal length.

Options: Stronger & Clearer Each Time

**PROMPT &
WRITE (1st Draft)**

**2 - 3
STRUCTURED
PAIR MEETINGS**

**WRITE
(2nd Draft)**

**Partners both
have 'wrong'
answers**

**Only 1 partner
has a 'right'
answer**

**Partners both
have 'right'
answers**

Options: Stronger & Clearer Each Time

**PROMPT &
WRITE (1st Draft)**

**2 - 3
STRUCTURED
PAIR MEETINGS**

**WRITE
(2nd Draft)**

**Partners both
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answers**

**That's ok!
They will have a
chance to refine
their thinking by
explaining their
thinking!**

**Only 1 partner
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Options: Stronger & Clearer Each Time

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WRITE (1st Draft)**

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**That's ok!
They can
compare their
thinking with
each other!**

**Partners both
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answers**

Options: Stronger & Clearer Each Time

**PROMPT &
WRITE (1st Draft)**

**2 - 3
STRUCTURED
PAIR MEETINGS**

**WRITE
(2nd Draft)**

**Partners both
have 'wrong'
answers**

**That's ok!
They will have a
chance to explain
more and refine
their thinking!**

**Only 1 partner
has a 'right'
answer**

**That's ok!
They can
compare their
thinking with
each other!**

**Partners both
have 'right'
answers**

**That's ok!
They can push
each other to
include what the
other has in their
answer - making
it more
comprehensive!**

Promoting Language *and* Content Development

SUPPORT SENSE-MAKING:

Scaffold tasks & amplify language so students can make their own meaning.

OPTIMIZE OUTPUT:

Expand opportunities for students to describe their mathematical thinking to others orally, visually, & in writing.

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MLR 3: Critique, Correct, and Clarify

Purpose: To give students a piece of mathematical writing that is not their own to analyze, reflect on, and develop.

The intent is to prompt student reflection with an incorrect, incomplete, or ambiguous written argument or explanation, and for students to **improve upon the written work by correcting errors and clarifying meaning.**

MLR 3: Model the Critique, Correct, and Clarify

- Teachers can model how to effectively and respectfully critique the work of others with **meta-think-alouds and press for details when necessary**.
- This routine fortifies output and engages students in meta-awareness.

Help Caleb

$$7(x - 3) - 2(x + 5)$$

$$7x - 21 - 2x + 10$$

$$5x - 11$$

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$$7x - 21 - 2x + 10$$

$$5x - 11$$

Clarify: Why do you think the student wrote this?

Caleb was thinking that 2 times 5 = 10, but the problem says -2 times +5.

Help Caleb

$$7(x - 3) - 2(x + 5)$$

$$7x - 21 - 2x + 10$$

$$5x - 11$$

Clarify: Why do you think the student wrote this?

Caleb was thinking that 2 times 5 = 10, but the problem says -2 times +5.

Critique: What changes do you suggest? Why?

Caleb should circle the terms with their signs so he can make sure he is using the correct rules.

Help Caleb

$$7(x - 3) - 2(x + 5)$$

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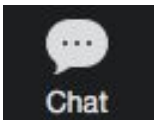
Correct: Correct the response.

$$7(x - 3) - 2(x + 5)$$

$$7x - 21 - 2x - 10$$

$$5x - 31$$

Let's Brainstorm

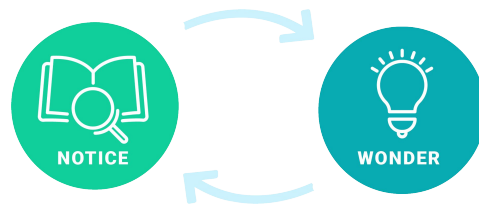


Share in the chat:

What teacher moves can you implement to provide meaningful opportunities for students to discuss, reflect and engage with this problem?

Options - Clarify, Critique, & Correct

Clarify: Why do you think the student wrote this?



Critique: What changes do you suggest? Why?

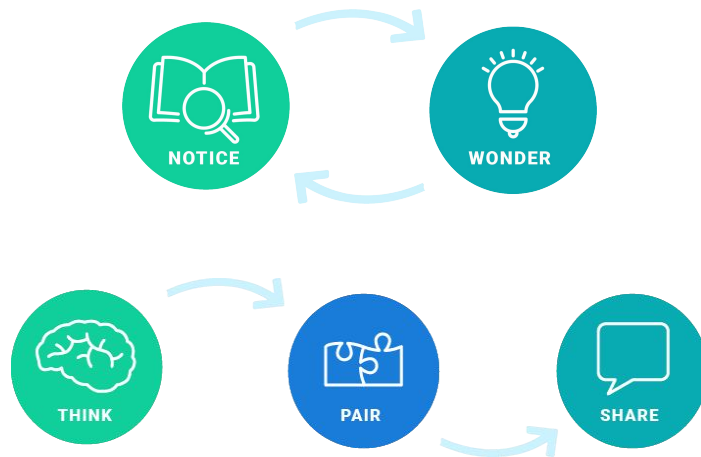
Correct: Correct the response.

Options - Clarify, Critique, & Correct

Clarify: Why do you think the student wrote this?

Critique: What changes do you suggest? Why?

Correct: Correct the response.



Options - Clarify, Critique, & Correct

Clarify: Why do you think the student wrote this?

Critique: What changes do you suggest? Why?

Correct: Correct the response.



Build

How can we make this work actionable?

Let's Explore: Strategy Choice Board

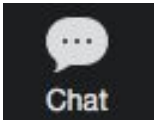
Choose any of the sections below and explore the related BL resources & strategies.

MLR Deep Dive:
**Stronger and
Clearer**

MLR Deep Dive:
**Clarify, Critique,
& Correct**

Scaffolding:
**Accountable
Talk**

Let's Reflect



Share in the chat:

What is your biggest takeaway from this time of exploring the resources?

Q & A

What questions do you have about our conversation today?





We value your feedback!

Your input is important to us, please take a moment to complete our survey using the link in the chat.

Thank you!

