

# Differentiating Math Tasks for ELs

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# When you think of math what is the first thing that comes to your mind?



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# Framing Learning

*Differentiation and EL needs.*

*Develop our teacher "mindset"*

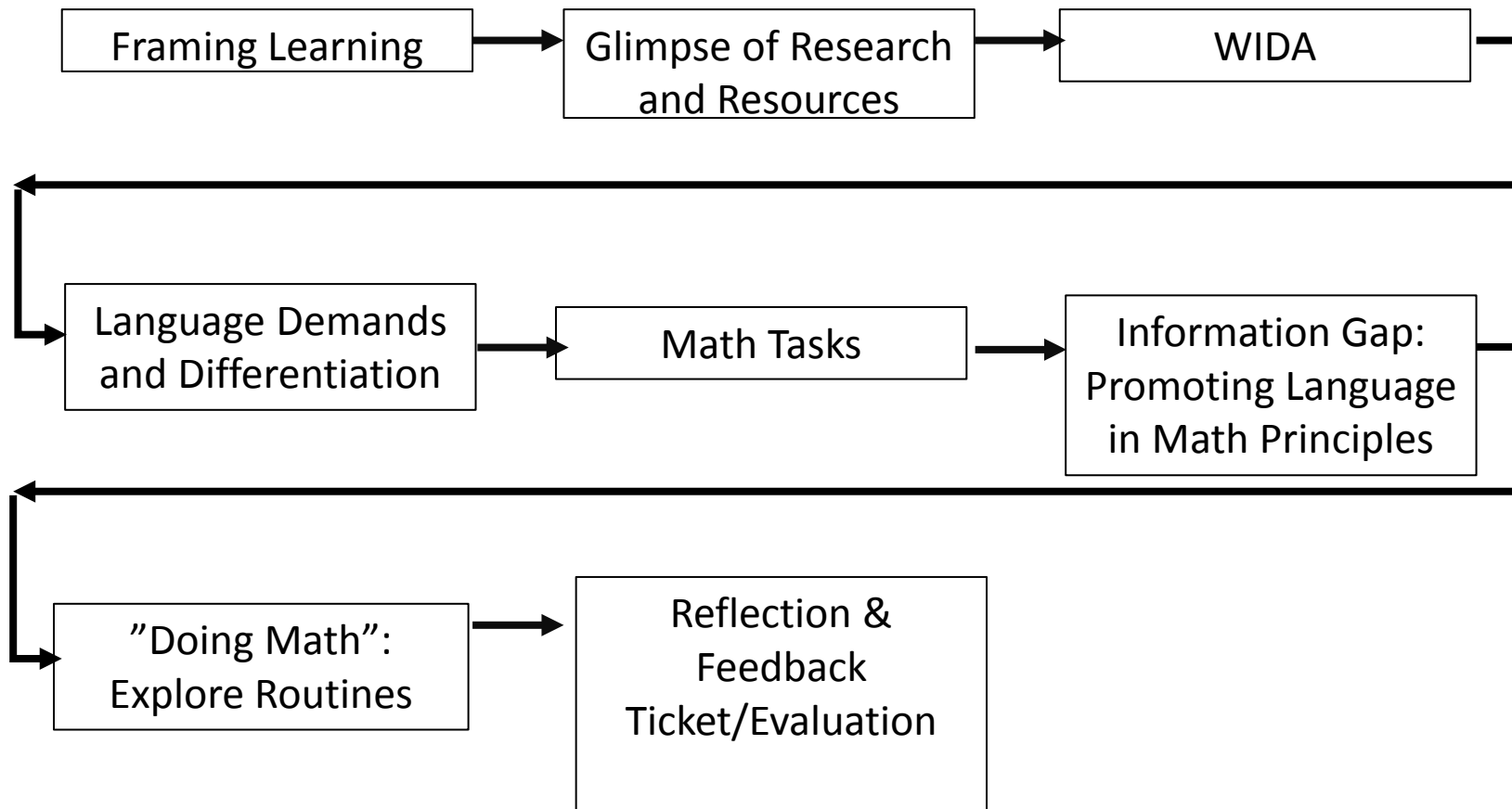
Objectives for Learning Session:

- Develop an understanding of approach to math instruction that promotes language.
  - Explore language routines that promote language.
- 
- Experience a language math routines through "doing math."



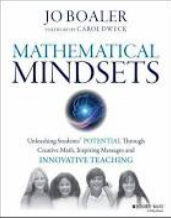

*Understanding of how the brain learns and how this affects math.*

**Review the WDIA Framework.**

# Agenda-Learning Journey



# Research and References

	<p>Leinwald, S., Brauer, D.J., Huinker, D., Berry III, R.Q., Dillon, F.L., Larson, M.R., ...Smith, M.S. (2014). <i>Principles to Actions Ensuring Mathematical Success for All</i>. Reston, VA: NCTM.</p>
	<p>Can-Do Descriptors Levels of Language Development Standards</p>
	<p>Boaler, J. (2016). <i>Mathematical Mindsets</i>. San Francisco, CA: Jossey-Bass.</p> <p> Youcubed.org (Videos)</p>
<p><b>Understanding Language/SCALE</b> Stanford Graduate School of Education</p>	<p>Zwiers, J., Dieckman, J., Rutherford-Quach, S., Daro, V., Skarin, R., Weiss, St., Malamut, J. (2017). <i>Principles for the design of mathematics curriculum: Promoting language and content development. Understanding Language, 2.</i></p>

# Language Stages-WIDA

Language Stages	WIDA: Levels
Silent Stage (Pre-production)	Level 1: Entering
Early Production	Level 2: Emerging
Speech Emergence	Level 3: Developing
Intermediate	Level 4: Expanding
Advance	Level 5: Bridging
	Level 6: Reaching

# Backwards Bicycle



# **How to pick math tasks for all learners?**





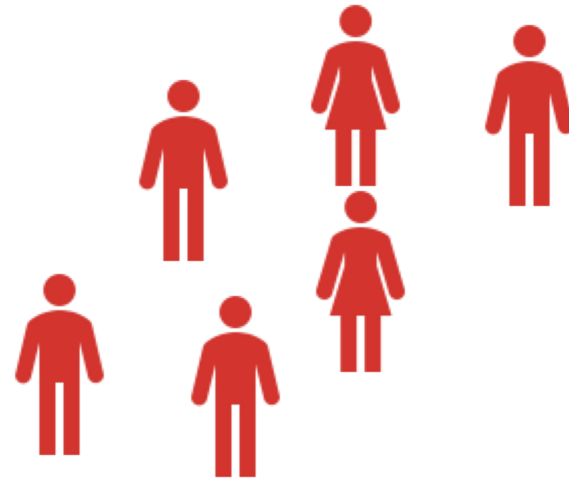
High Ceiling



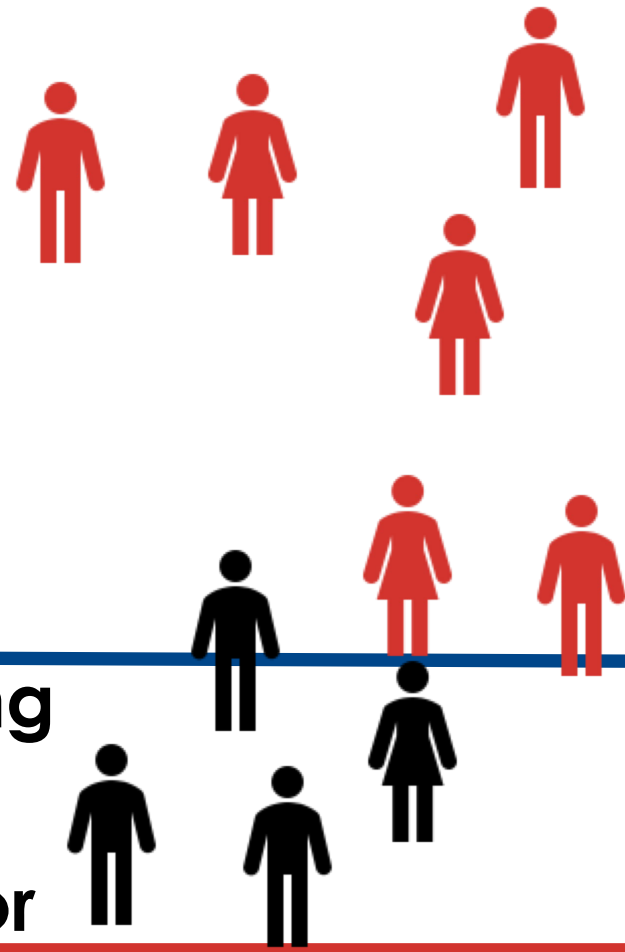
High Floor



frustrated,  
intimidated,  
unable to start



Underserved,  
bored,  
unreached  
potential



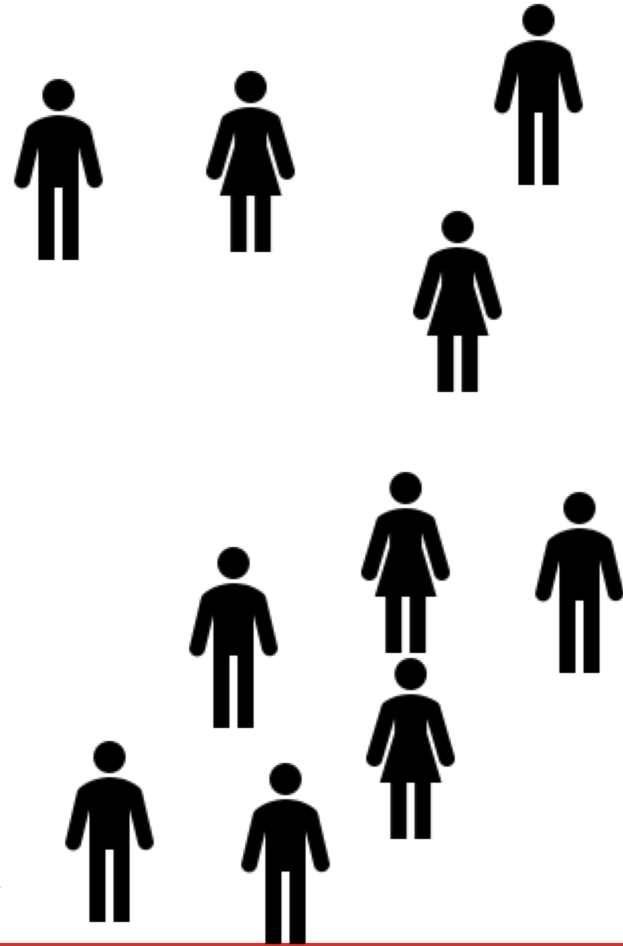
**Low Ceiling**

**Low Floor**

High Ceiling



Low Floor



# How to pick math tasks for all learners?

- ❑ Task that promote “doing” mathematics
- ❑ Has multiple entry points and various solution pathways

-“Low Floor, High Ceiling”

- ❑ Require exploration of mathematical relationship
- ❑ Students explore the task first and then formalize and connect solution methods

# Doing Math

## Wafers and Crème Task - Notice & Wonder

Mrs. Danko was looking at the back of the packages of two different Oreos packages.

The regular Oreos stated 3 Oreos had 160 calories. The double stuffed packages said 2 Oreos had 140 calories.

- ✓ Task that promote “doing” mathematics
- ✓ Has multiple entry points and various solution pathways  
-”Low Floor, High Ceiling”
- ✓ Require exploration of mathematical relationship
- ✓ Students explore the task first and then formalize and connect solution methods

How many calories in one single layer of crème?

# Differentiation?

What is it and what does it mean to you?

**Differentiation** refers to a wide variety of teaching techniques and lesson adaptations that educators use to instruct a diverse group of students, with diverse learning needs, in the same course, classroom, or [learning environment](#).

Also called “differentiated instruction,” differentiation typically entails modifications to [practice](#) (how teachers deliver instruction to students), [process](#) (how the lesson is designed for students), [products](#) (the kinds of work products students will be asked to complete), [content](#) (the specific readings, research, or materials students will study), [assessment](#) (how teachers measure what students have learned), and [grouping](#) (how students are arranged in the classroom or paired up with other students).

# Promoting Language in Math Principles

\* Information Gap

Principle 1: Support sense-making

Principle 2: Optimize output

Principle 3: Cultivate conversation

Principle 4: Maximize linguistic and cognitive meta-awareness

# Promoting Language in Math Principles

**Principle 1: Support sense-making**

**Principle 2: Optimize output**

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## Language Routines

**MLR1: Stronger and Clearer Each Time**

**MLR2: Collect and Display**

**MLR3: Critique, Correct, and Clarify**

**MLR4: Information Gap**

**MLR5: Co-Craft Questions and Problems**

**MLR6: Three Reads**

**MLR7: Compare and Connect**

**MLR8: Discussion Supports**



# Math Language Routines

## MLR1: Stronger and 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).

# Math Language Routines

## MLR2: Collect and Display

Purpose: To capture students' oral words and phrases into a stable collective reference.

# Math Language Routines

## MLR3: Critique, Correct, and Clarify

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

# Math Language Routines

## MLR4: Information Gap

Purpose: To create a need for student to communicate (Gibbons, 2002).

# Math Language Routines

## MLR5: Co-Craft Questions and Problems

Purpose: To allow students to get inside of a context before feeling pressure to produce answers, to create space for students to produce the language of mathematical questions themselves, and to provide opportunities for students to analyze how different mathematical forms can represent different situation.

# Math Language Routines

## MLR6: Three Reads

Purpose: To ensure that students know what they are being asked to do, create opportunities for students to reflect on the ways mathematical questions are presented, and equip students with tools used to negotiate meaning (Kelemanik, Lucenta & Creighton, 2016).

# Math Language Routines

## MLR7: Compare and Connect

Purpose: To foster students' meta-awareness as they identify, compare, and contrast different mathematical approaches, representations, concepts, examples, and language.

# Math Language Routines

## MLR8: Discussion Supports

Purpose: To support rich and inclusive discussions about mathematical ideas, representations, contexts, and strategies (Chapin, O'Connor, & Anderson, 2009).



# Differentiation?

**Practice-  
*Delivery***

**Process-*Lesson  
Design***

**Products-*Activity  
or Work***

**Content-*Reading or  
Materials***

**Assessment-*How  
Understanding will  
be Measured***

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# ★ 3-Read Protocol

- First Read: Teacher reads the problem stem orally.

*Key Question: What is the situation about?*

- Second Read: Class does choral read or partner read of the problem stem.

*Key Question: What are the quantities in the situation?*

- Third Read: Partner or choral read the problem stem orally one more time.

*Key Question: What mathematical questions can you ask?*

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## What questions could we ask?



# Wafers and Crème Task - Notice & Wonder



How many  
calories  
in one  
single  
layer of  
crème?

Double Stuff Crème =  
2 x Single Crème

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# Standard Addressed

- 8.EE.C.8.b- Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example,  $3x + 2y = 5$  and  $3x + 2y = 6$  have no solution because  $3x + 2y$  cannot simultaneously be 5 and 6.*

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# Reflection and Exit Ticket

## Objectives for Learning Session:

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Twitter: @kristinadanko



[LINK TO SURVEY:](#)

<https://tinyurl.com/ELsmathTB>