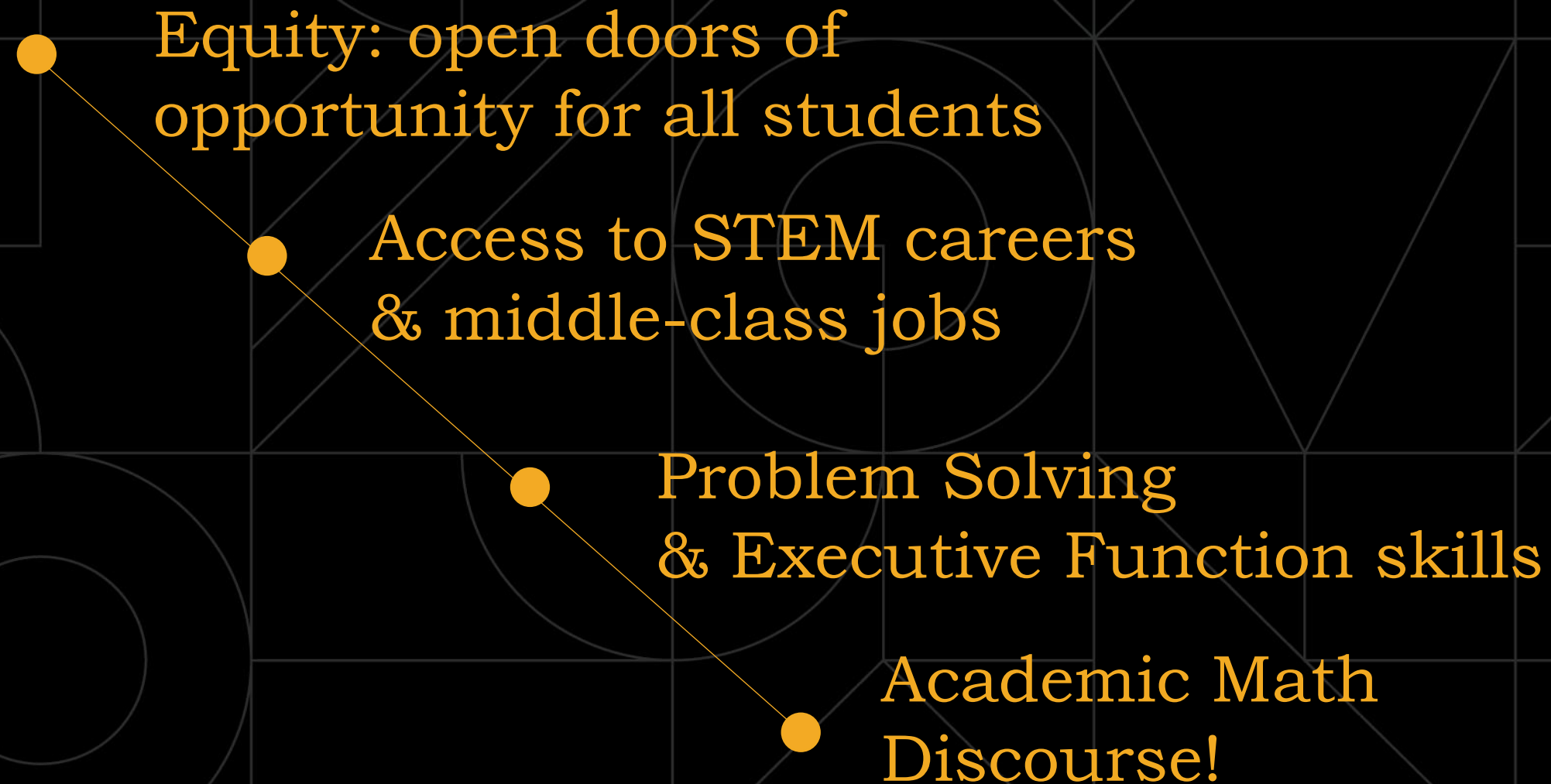# Helping Students Find Their Voice in Math: The Imagine Learning Language Advantage

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Connect the dots for me...

Equity: open doors of
opportunity for all students

Access to STEM careers
& middle-class jobs

Problem Solving
& Executive Function skills

Academic Math
Discourse!

In this session we will

- Discuss where language is present in the mathematics classroom
- Discuss strategies & best practices on how to support student's engagement with the language of mathematics
- Share the impact of culture on mathematics language acquisition

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"You can't learn math without language. There is an old idea that you can work around the language, and just get to content. This isn't true."

- Phil Daro

"Math is a universal language"

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$$

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Describe – Interpret – Connect - Share

Describe what you see	Interpret what you see	Connect with math or science concepts

Describe – Interpret – Connect - Share

- Describe what you see
- Interpret what you see
- Connect with math or science concepts

Did You Notice?

Think about what you wrote down:

- Use of analytical skills (observe, describe, reason, etc.)
- Your use of language to engage in this activity
- There were content connections through already existing understandings of math and language simultaneously

What are some scaffolds that you might build to support students in developing those?

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What strategies do you use to incorporate language in a mathematics classroom?

Meaning is not stored language.
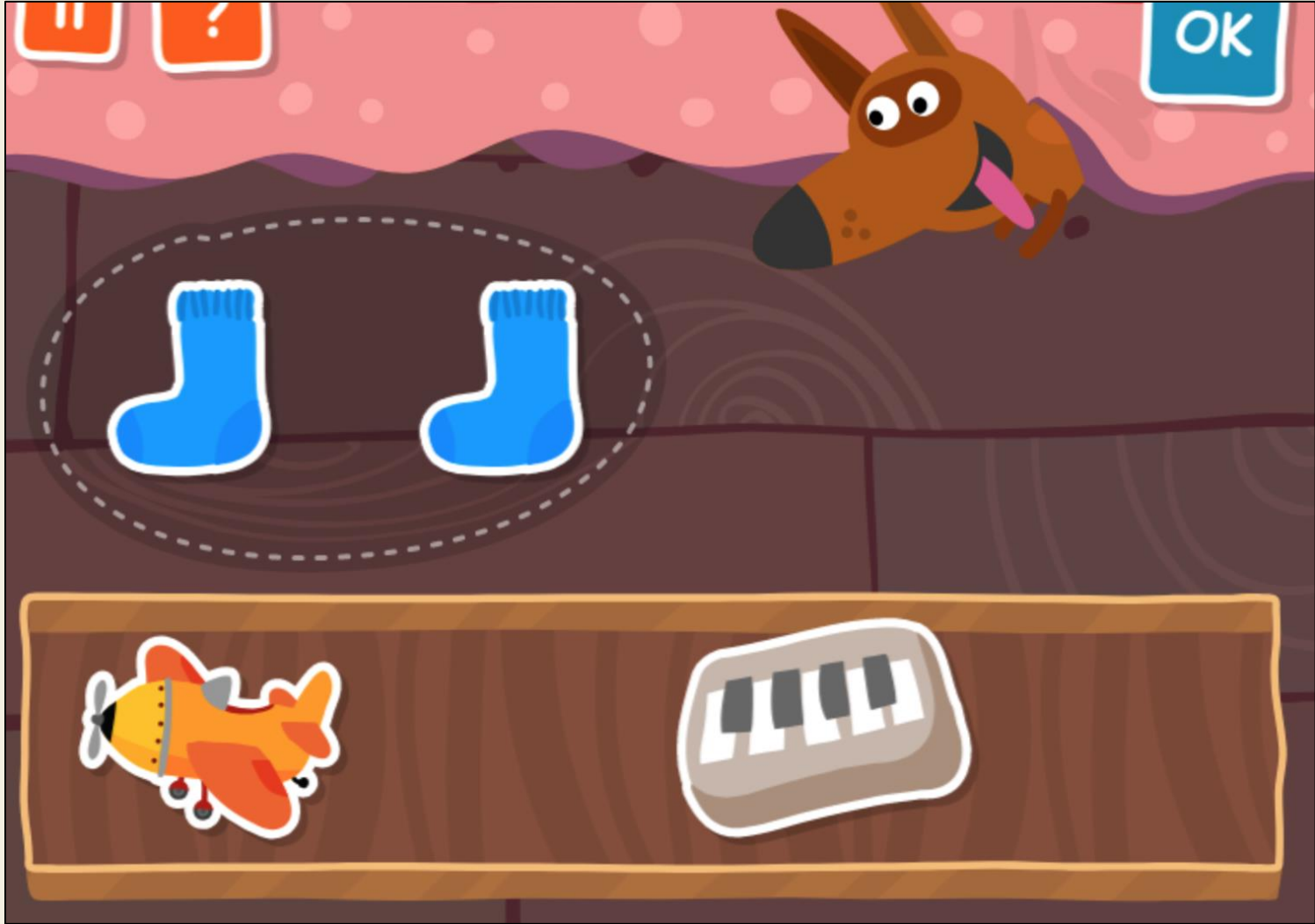Meaning is stored experience

Best practices

- Explicitly teaching discussion strategies
- Intentional planning for orchestrating discourse
- Contextualized vocabulary instruction

Vocabulary instruction is as important to math comprehension as it is to reading comprehension

-Bruun, Diaz, & Dykes (2015)

Intentional Math Vocabulary Instruction

Intentional Math Vocabulary Instruction

Technology Embedded with Multilingual Support

LIVE CERTIFIED TEACHER

Glossary Audio Support Language

✓ English
Spanish
Arabic
Haitian Creole
Tagalog
Vietnamese

Three students are working to find the solution set of this system of equations:

$y = x$

$y = x + 2$

Use the drop-down menus to complete the statements about each of their methods.

Write or Talk ✏️ 💬   🖨 PRINT JOURNAL PAGE

Reflect on the lesson. Use linking words and phrases in your responses.

1. Major Words and Phrases
Write at least one important math word or phrase that was used in this lesson. For each word or phrase, write the definition in your own words and draw a visual representation.

2. Problem-Solving Strategies
Write at least one strategy that you used in this lesson and describe how you used it.

3. Growth
Write about something you learned in this lesson, perhaps from a mistake you made, that you could apply to future problems.

4. Continued Learning
Write about questions you still have or something you want to learn more about.

Resources

| Example |
| Strategies |
| Linking Words and Phrases |

NEXT

How does culture impact math discourse in your classroom?

The Culture of a Math Classroom

- Draw on students' Funds of Knowledge
- Establish classroom norms for participation
- Position students as capable
- Recognize multiple forms of discourse and language as a resource
- Monitor how students position each other as math resources

-Bartell, Wager, Edwards, Battey, Foote, & Spencer, 2017

Discourse-rich Classroom Plan

	Educator	Student
See	• Cohesion in taking turns • Participation in whole group discussions • Purposeful student interactions	• Sentence stems and conversation starters • Built in time to talk • Opportunities for discourse
Hear	• Students doing most of the talking • Think alouds • Productive conversations	• Modeled discourse • Active listening during partner discussions • Students teaching students

Traditional dialogue vs. meaningful discourse

Low-level questions (What is? Where is? Which?)	High-level questions (How? Why?)
Yes/no response	Open-ended questions or statements (I know…)
Leading questions (Is the next step to . . . ?)	Nonleading questions (How should we proceed?)
Linear, stimulus-response environment	Multidimensional conversation
Focus on procedures, steps, solutions	Focus on thoughts, strategies, discussions
Focus on a right answer	Focus on possible solutions
Depth of knowledge (DOK) 1 or 2	Depth of knowledge (DOK) 3 or 4
Teacher-centered	Student-centered

-Walter, 2018

Successful Math Discourse

- Create wait time to think and process

- Use writing as a tool to assist in thinking and talking about mathematical concepts

- Guide student discussion by using talk moves, conversation starters, or teacher-created questions

-Walter, 2018

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What's the strategy?

How does it help?

High-level Questioning	Opportunity for meaningful discourse
Encourage positive math-related beliefs	Sets the tone, reduces negative self-talk and beliefs
Providing Rich Mathematical Tasks	Shift focus from right answers to a new form of thinking
Use of Talk Moves (Revoicing, Rephrasing, Reasoning, Elaborating & Waiting)	Promotes clarity and deeps math thinking

What are advantages and disadvantages to Turn and Talk?

Limitations of Turn and Talk:

- Wait time or cognitive processing time is nonexistent or minimal
- Turn and talk used in isolation is inequitable for our lowest-performing students.
- Turn and talk often does not foster higher-level cognition

-Walter, 2018

How can writing aid in mathematical discourse?

"Writing in mathematics gives me a window into my student's thoughts that I don't normally get when they just complete problems. It shows me their roadblocks, and it also gives me, as a teacher, a roadmap."

- Maggie Johnston, 9th Grade Math Teacher, Denver Colorado

Graphic Organizer

PROBLEM

THINK TIME

I know _____

I wonder _____

I don't know _____

PARTNER TALK AND REFLECTION

We said _____

I learned _____

Creative Writing in Math

- Write a story about 2 quantities with a linear relationship. Include a positive, negative, and zero slope in your story. Draw a graphical representation of your story with a description of the quantities compared.

Using what you know and have learned:

- Take 1 minute to reflect on how math language is attended to in your classroom/school/district
- Create a goal for your classroom/school/district on math discourse
- Write a few practical steps you can take to encourage more math discourse in your classroom/school/district

In this session we

- Discussed where language is present in the mathematics classroom
- Discussed strategies & best practices on how to support student's engagement with the language of mathematics
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"Education is the great equalizer."

Horace Mann

Language is its foundation.

Every student is a language learner.

Every teacher is a language teacher.

Questions?