



The Long Game: Strategies for Vertical Algebraic Growth

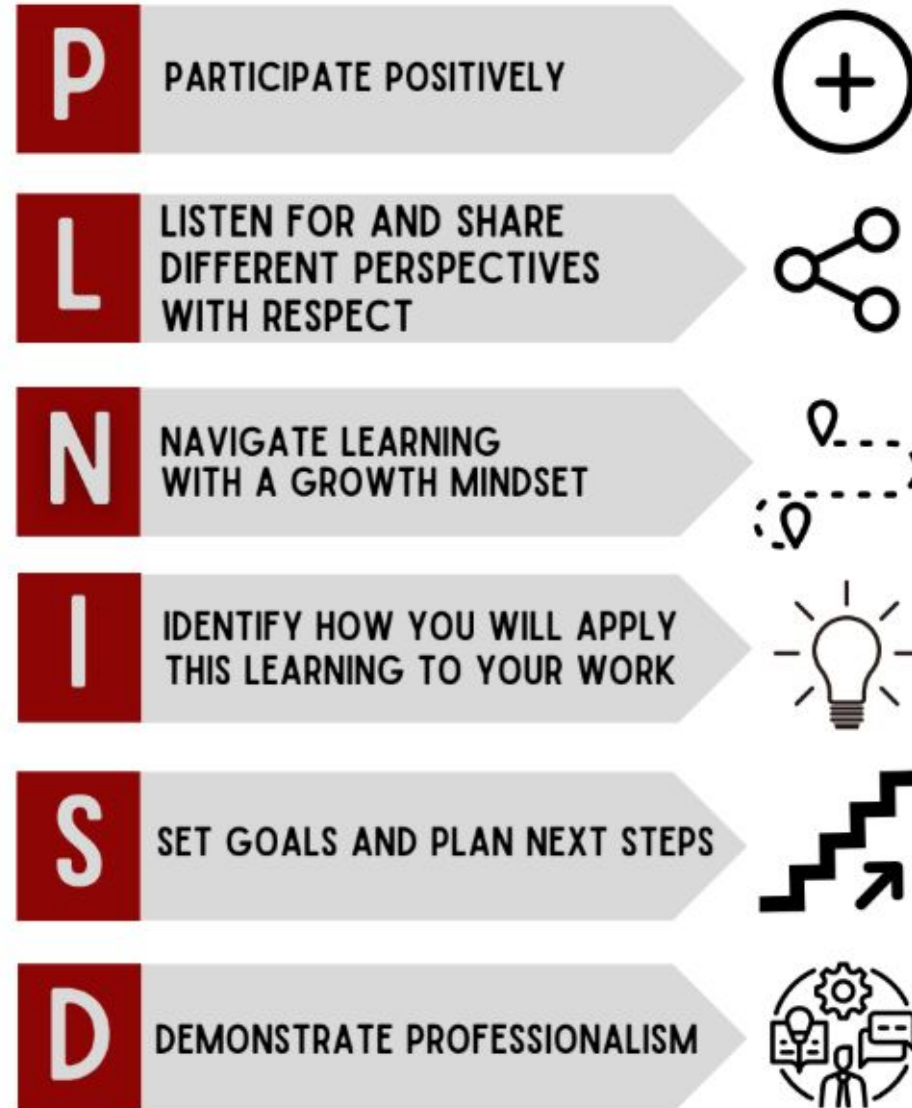
Please join: <https://app.peardeck.com/student/togugftkp>

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Northwest ISD
Professional Learning Expectations
A Culture of Learning





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How would you count these?

Make your thinking visible using the drawing tool.



Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar



Learning Target



Today I will explore the vertical journey of algebraic thinking **so I can** demystify "big" concepts for my students and connect them to their prior knowledge.

I'll know I have it when I can explain the vertical evolution of algebraic reasoning and identify exactly how my course **prepares students for the demands of future mathematics.**



PART 1:

Equality & Balance

**Establishing the core relationship
that evolves across grade bands.**

Big Idea #1: The Equal Sign

The Relationship Shift

- The **Equal Sign** as a relationship, not an operator.
- Equality is balance: moving from missing parts to inverse operations.

$$8 + \square = 13$$



"The mathematics evolves, but the reasoning remains connected."

Whether solving or analyzing, the student is maintaining a relationship between values. We must keep that connection visible.

Chew 1: What Stays the Same?

Analyze these grade band equations:
What understanding is required? What stays conceptually identical?

Grade Band	Equation Example	Concept Focus
Elementary	$7 + \square = 10$	
Middle School	$3x = 18$	
High School	$2 (x + 1) = 8$	
Advanced	$x^2 - 9 = 0$	



PART 2: Generalization

Bridging arithmetic to functional
thinking through visual patterns.

Big Idea #2: The Bridge

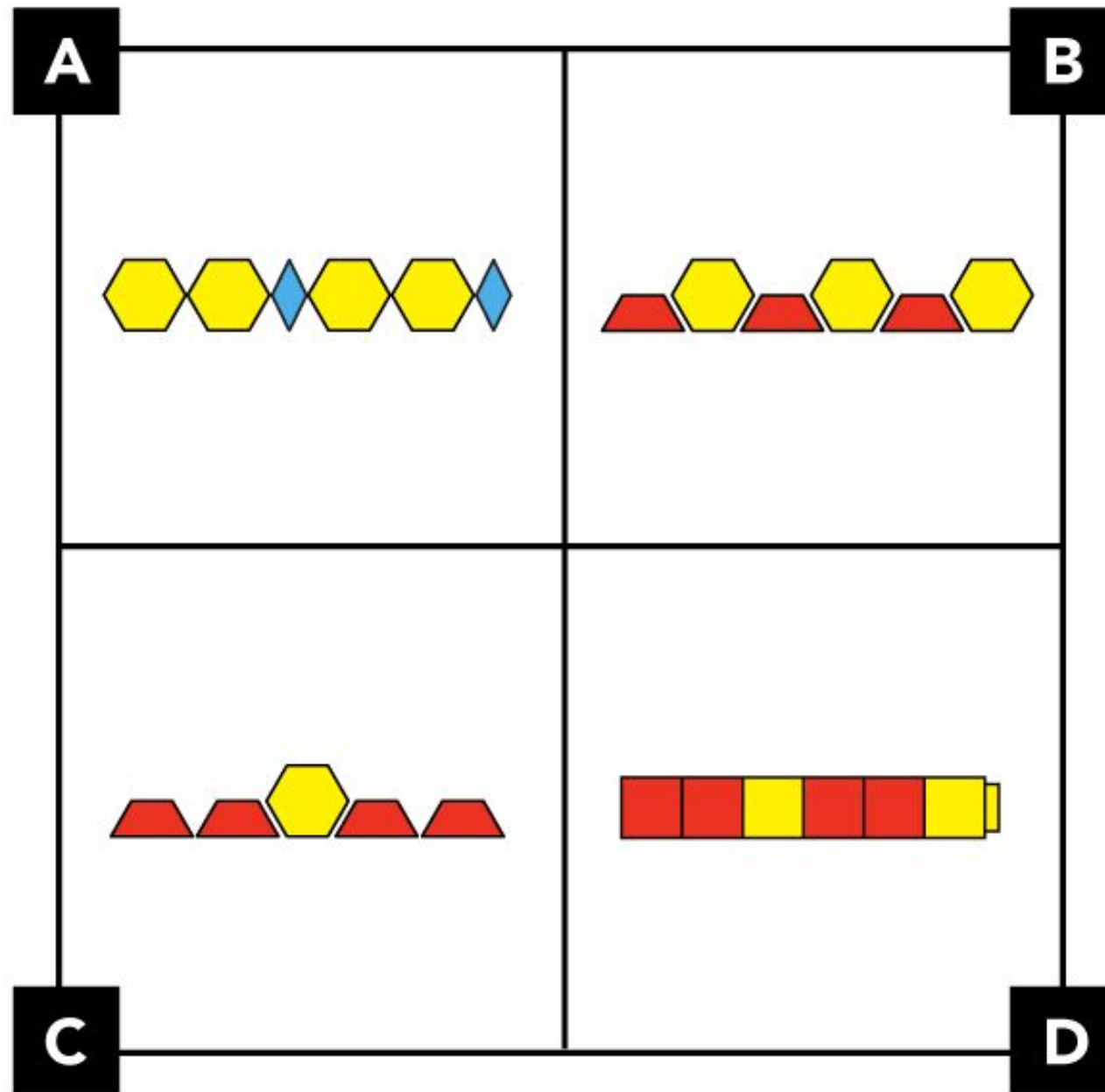
Patterns → Generalization

Patterns are the visual story of arithmetic becoming algebra. They allow students to describe **change** and **constants** before they ever touch a formal rule.

*The investigation starts with looking,
not calculating.*



Which One
Doesn't
Belong?



Chew 2: Pattern Investigation

$$3-3=0$$

$$3-2=1$$

$$3-1=2$$

$$3-0=3$$

$$(3)(-3)=-9$$

$$(2)(-3)=-6$$

$$(1)(-3)=-3$$

$$(0)(-3)=0$$

$$3^4=81$$

$$3^3=27$$

$$3^2=9$$

$$3^1=3$$

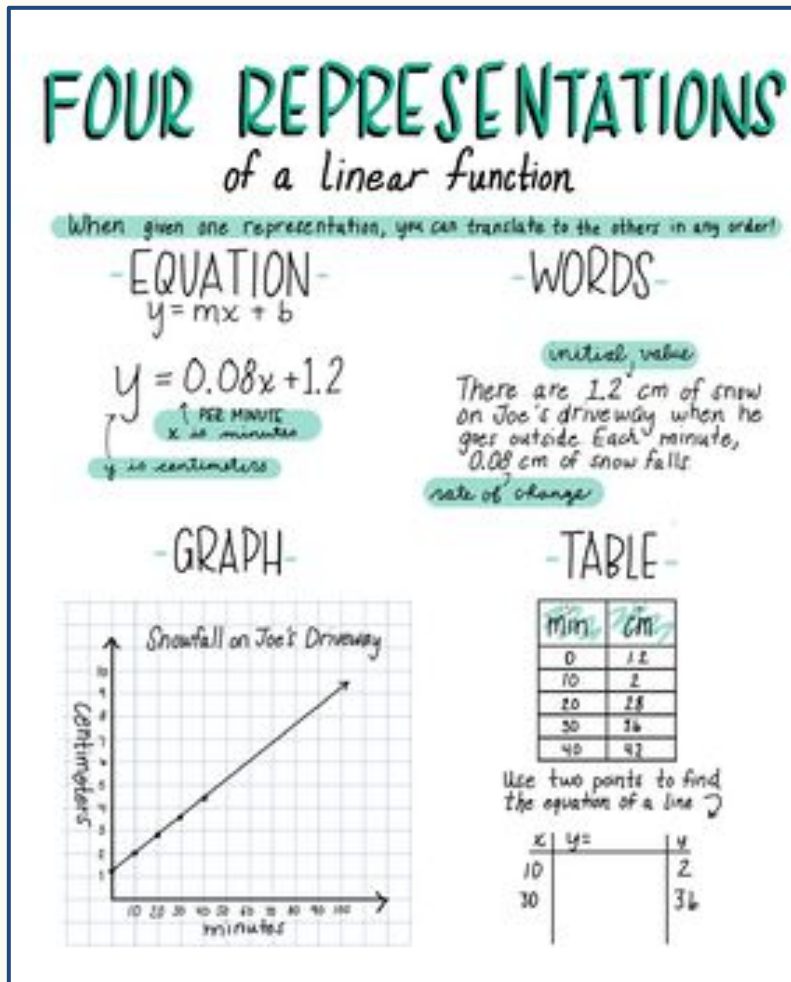


PART 3:

Connecting the Plot

How different representations tell
the same story across the K–12 path.

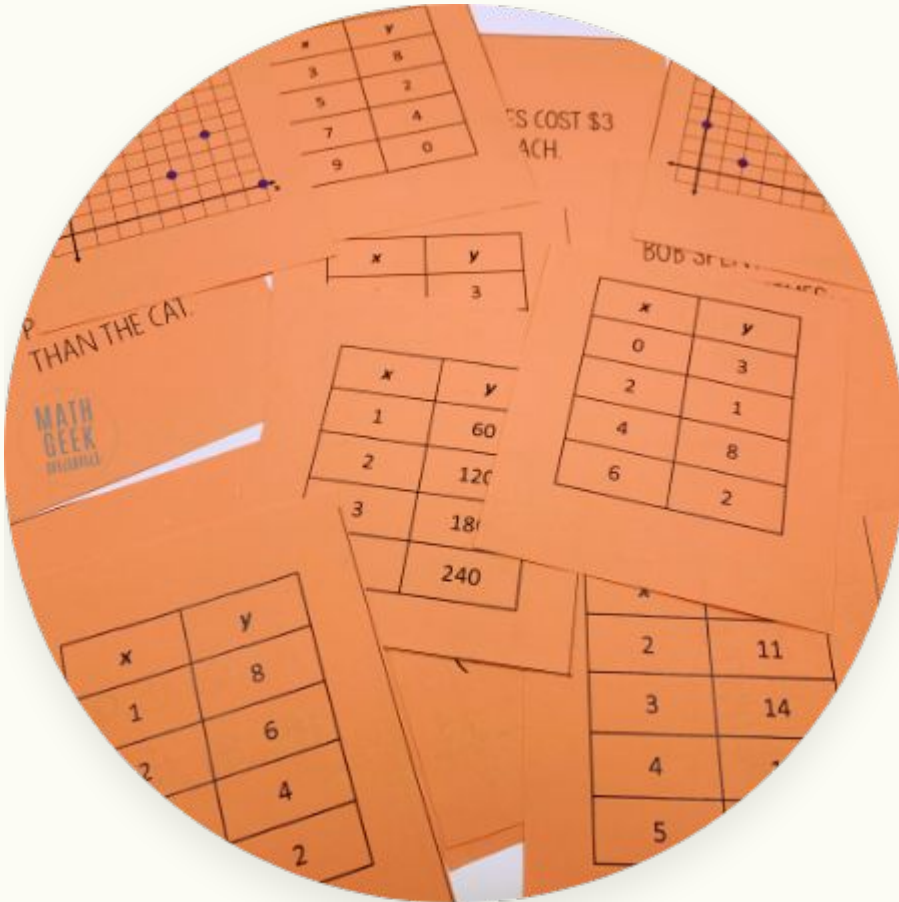
Big Idea #3: Symbol Story



- Representations reveal different features of a relationship
- Deep understanding comes from making explicit connections between them.
- Moving from blocks to tables to graphs to formal symbols

Chew 3: The Match

Match the Graphs, Tables, Equations and Verbal Descriptions.



The Reflection

- Which representation is usually emphasized in your room?
- Which representation is most accessible for struggling learners?

Synthesis: Vertical Alignment

Before Me

Prerequisite
reasoning: What
understanding do
students need
entering my
course

In My Grade

Current Bridge:
What am I
building?

After Me

Future
dependency:
What future
mathematics
depends on this?



Instead of seeing standards as isolated, start seeing the story.



Closing Thoughts

"The story is only as strong as its connections."

Thank you for joining today's journey.

Grab your Participant Handout for the progression charts!

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<https://tinyurl.com/ENGAGE26FB>



High-Impact Facilitation



Avoid Rescuing

Use prompts like "Say more" or "What makes you think that?" to push the thinking back to them.



Public Charting

Capture teacher language in a public space to model how everyday words evolve into algebra.



Target Coherence

Always connect activity debriefs back to structure, generalization, and K–12 coherence.

Image Sources



https://media.teaching.com.au/uploads/ed2185/zoom/ed2185_balance-wooden-scales-early-measurement-tool-wooden_v1_3.webp

Source: www.teaching.com.au



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