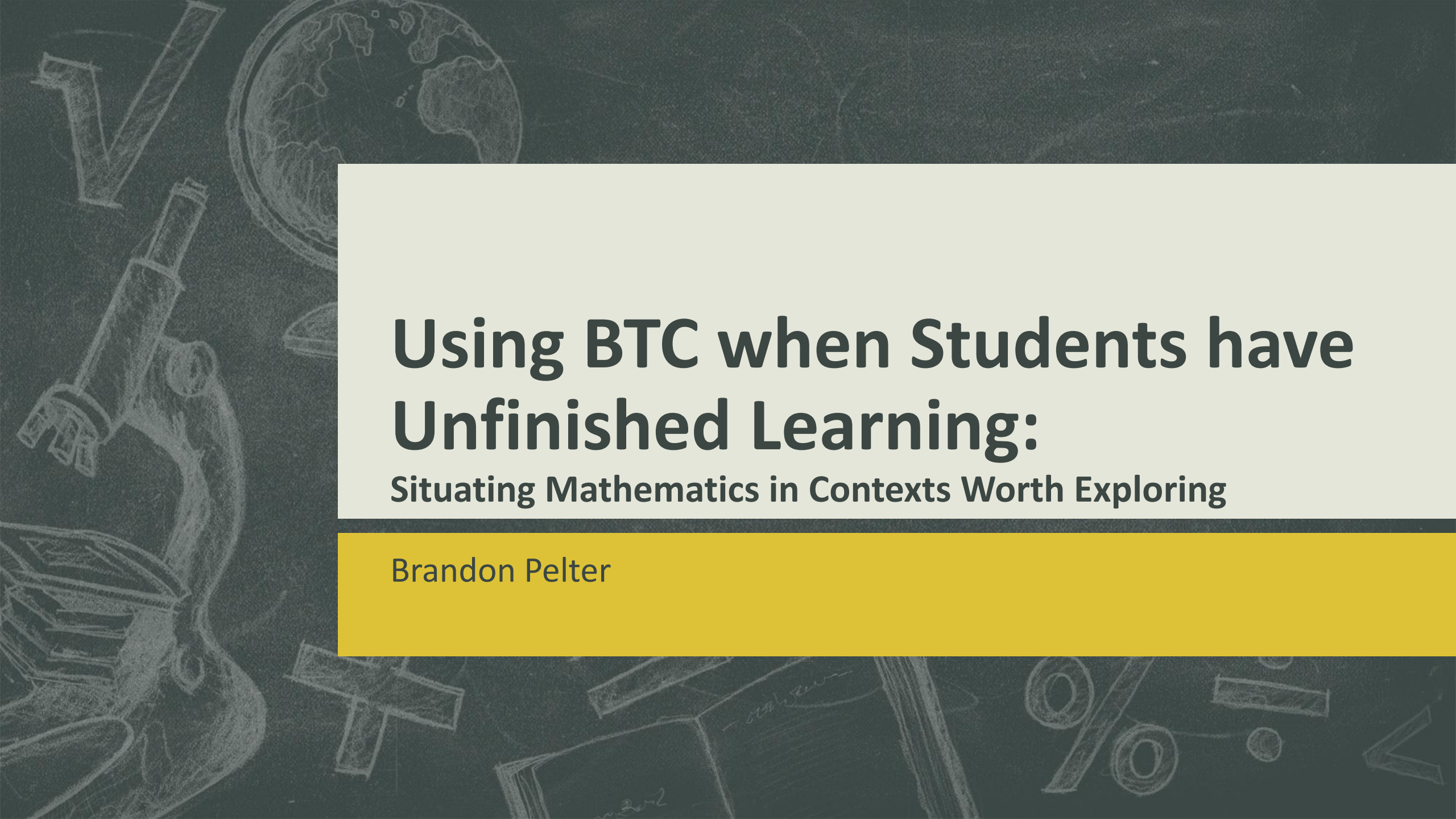


Using BTC when Students have Unfinished Learning:

Situating Mathematics in Contexts Worth Exploring

Brandon Pelter

About Me

- Career change
  - Sports broadcaster → Paraprofessional → High School math teacher
- Bridgeport Public Schools – H.S., teacher and math coach
- Extreme variation in student ability – from number lines to add and subtract through students at/above grade level

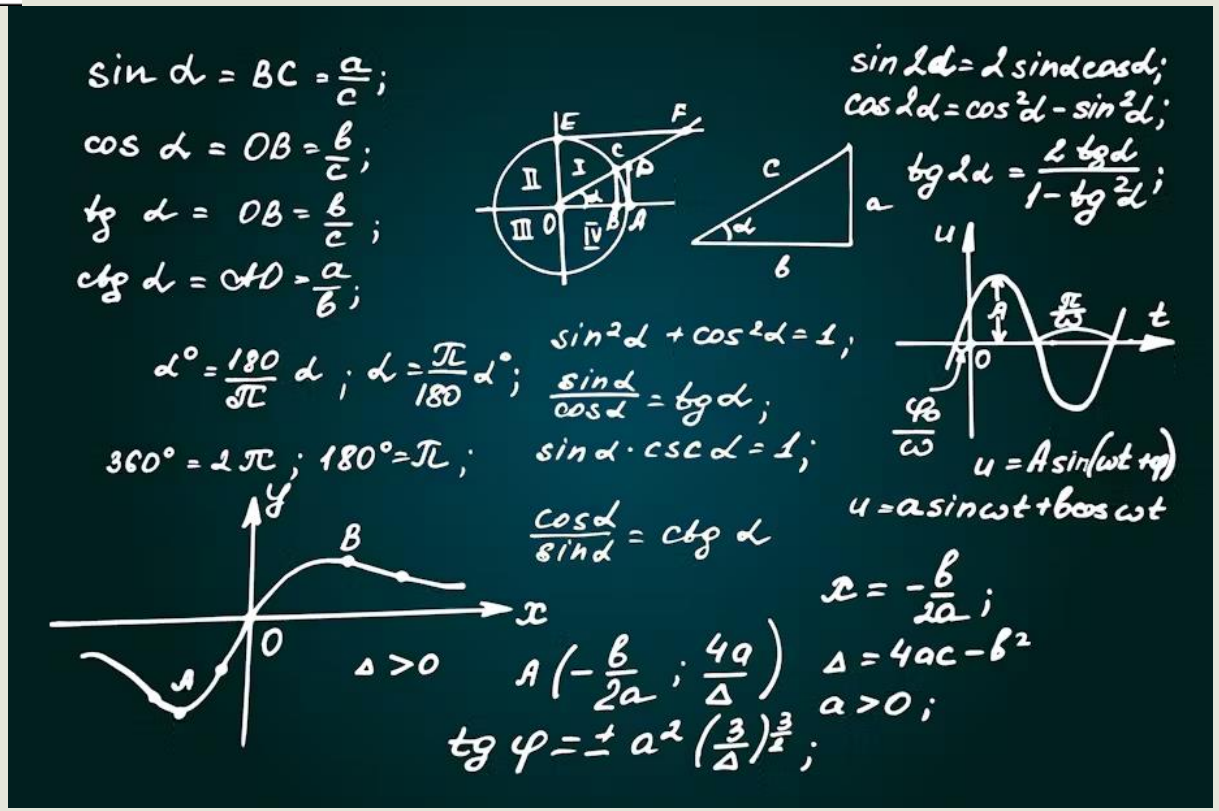
Rundown

- Lowering the Floor
- Connections to the brain
- Tangible Contexts
  - Food Orders
  - Ball Bounce
  - Visual Patterns

$$3^x + 3^y + 3^z = 837$$

$x = ?$ $y = ?$ $z = ?$

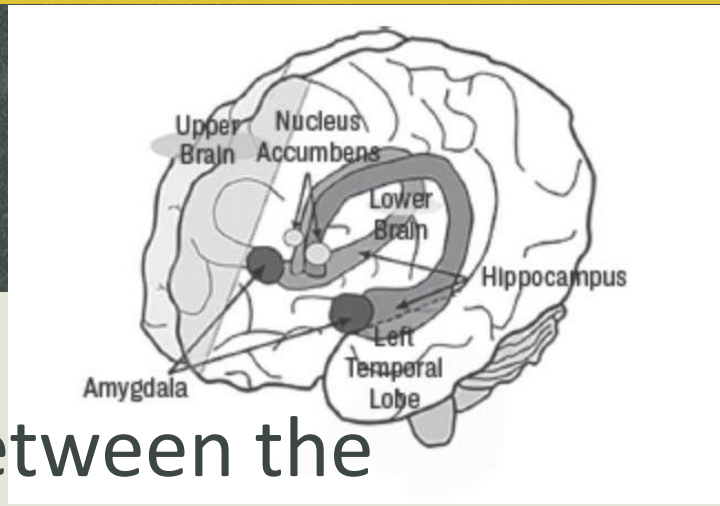
nts get out



Low Floor High Ceiling

- "Abstract" mathematics has limited entry points
  - Direct Instruction becomes the *lone* option if that's we only present abstract math to students
- It's all about providing an entry point for our students
  - Low Floor ≠ Easy
  - Low Floor = Accessible
- Even with low floor we want to advance students towards abstract thinking and representations

Rooted in "Brain Science"



- The Amygdala – directs communication between the lower brain and upper brain
- Lower brain → primitive (reptilian brain) – automatic functions like breathing and digestion **plus involuntary actions like fight-flight-or-freeze**
- Upper brain → prefrontal cortex – executive functioning, where memory is constructed

* McTighe, J. & Willis, J. *Upgrade your teaching: understanding by design meets neuroscience*

Triggers to the Lower Reactive Brain

- Examples of stressors that activate the lower brain:
  - Fear of being wrong
  - Frustration with material that students believe exceeds their understanding
  - Feeling overwhelmed
  - Boredom

Motivation

- Two main factors
  - Subjective Value – importance Ss assign the learning
  - **Expectations – Ss estimation of their own ability to achieve it**
- “If their perception is that they will not be able to do it, their motivation will plummet” (Martin, p. 128, 2024)

Tangible Contexts

It's Not About "Real World"

Why do we try to put mathematics in context?

My goal is to give students opportunities to contextualize and make sense of the math. A "tangible context" serves as a scaffold, typically helping students make sense of a certain math procedure or relationship.

Elimination in Context

Landin's	Landin's	Landin's
Order #1	***Order #2***	***Order #3***
1 burger 1 soda	1 burger 0 soda	3 burgers 2 sodas
Total $7.50	**Total $5.00**	**Total $**

1

Cinema World

Order #1

2 sodas
1 large popcorn

Total: $13.50

Cinema World

Order #2

3 sodas
1 large popcorn

Total: $17.50

C

Ord

2 soc
2 larg

4

Samurai Sushi

Order #1

5 sushi rolls
2 sodas

Total $30.75

Samurai Sushi

Order #2

8 sushi rolls
2 sodas

Total $46.50

Samurai Sushi

Order #3

3 sushi rolls
2 sodas

Total $

Pizza Planet

Order #1

3 slices
2 cannoli

Total $10.15

Pizza Planet

Order #2

1 slice
1 cannoli

Total $3.95

Pizza Planet

Order #3

2 slices
1 cannoli

Total $

Pizza Planet

Order #4

2 slices
5 cannolis

Total $

Burger Barn

Order #3

3 cheeseburgers
2 sodas

Total: $.

3

The Taco Room

Table #1

Alex

4 tacos
3 burritos

Total: $29.85

The Taco Room

Table #2

Maria

4 tacos
1 burritos

Total: $18.35

6

Sammy's Sandwiches

Order #1

1 sandwich
2 sodas

Total $11.00

Sammy's Sandwiches

Order #2

3 sandwiches
7 sodas

Total $34.25

Sammy's Sandwiches

Order #3

3 sandwiches
4 sodas

Total $

Restaurant 1

Order 1	Order 2	Order 3
1 Burger	4 Burgers	3 Burgers
2 Fries	4 Fries	3 Fries
Total $18.00	**Total $58.00**	**Total $_____**

Restaurant 2

Order 1	Order 2	Order 3
3 Quesadillas	13 Quesadillas	6 Quesadillas
4 Empanadas	12 Empanadas	4 Empanadas
Total $44.50	**Total $171.50**	**Total $_____**

Restaurant 3

Order 1	Order 2	Order 3
2 Sesame Chicken	2 Sesame Chicken	4 Sesame Chicken
2 Egg Rolls	3 Egg Rolls	5 Egg Rolls
Total $38.00	**Total $41.00**	**Total $_____**

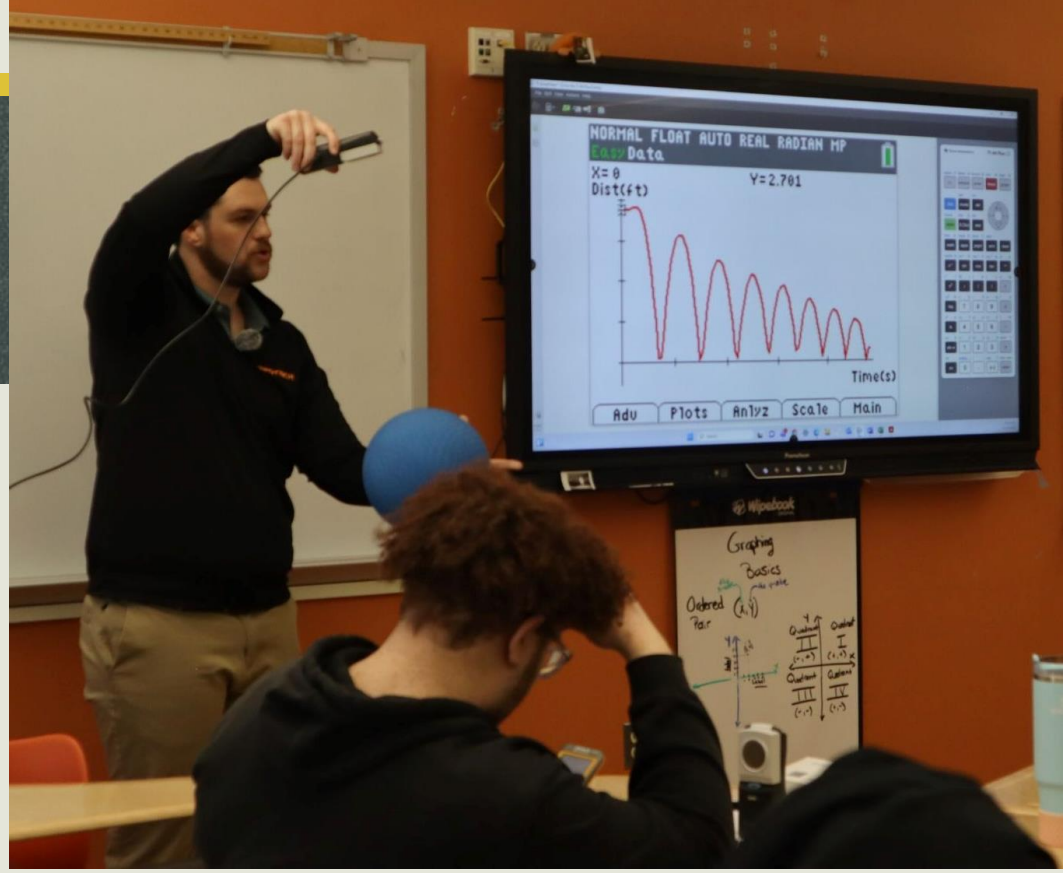
Ball Bounciness

1. Predict what kind of graph this experiment will create.

2. Drop your ball, recording the **maximum height** after **each bounce** in a table.

3. Then, create a graph of your data.

4. Using your data, write a function rule to represent your graph. Prove it using Desmos.



Keys to Success

- A tangible context allow students to make sense of the math – relationships and/or procedures
- We can't stay in context forever… leverage contexts for low-floor entry to understand something abstract. Then move towards abstract work.
- Even if students understand something well in context, they still need lots of practice out of context!

Visual Patterns

Patterns lie at the heart of Algebra – help students **see** them

Let's Try One – Pattern #19

Figure 1

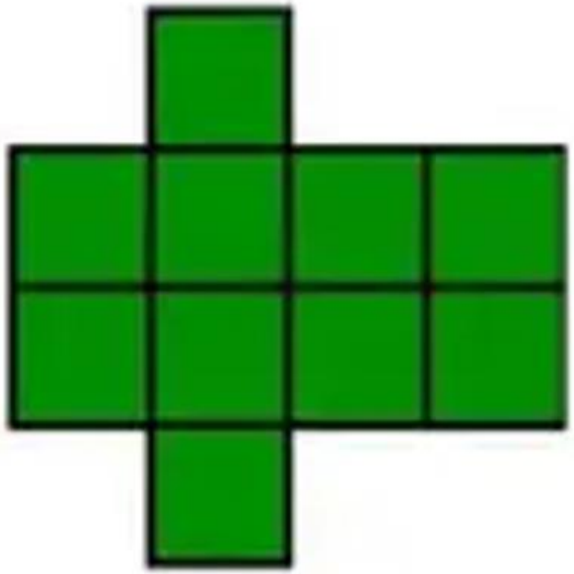


Figure 2

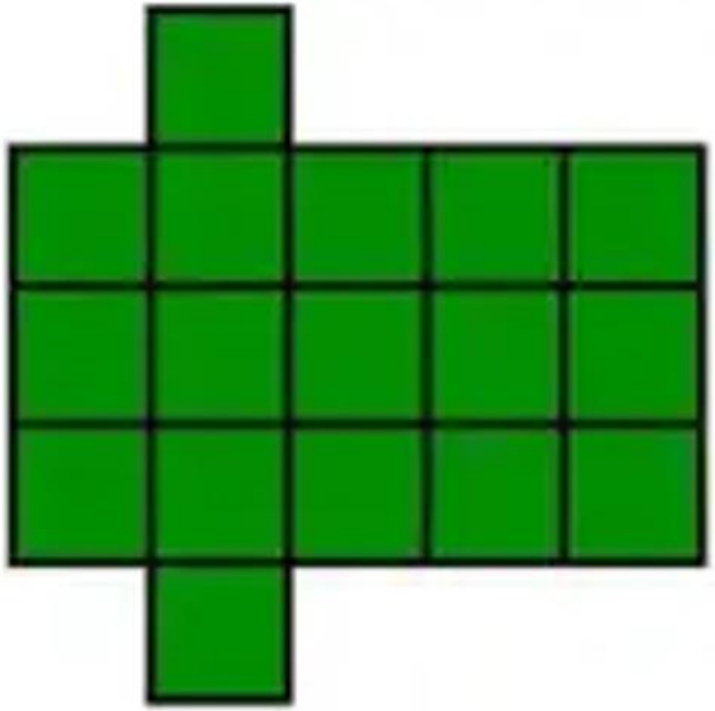
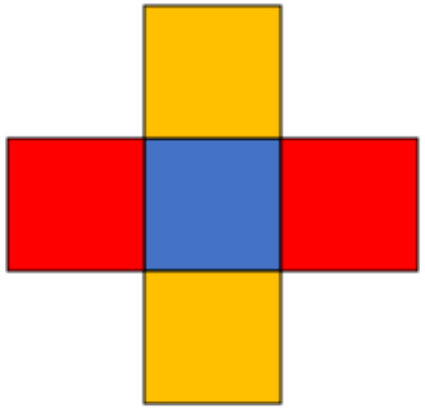


Figure 3

Let's Try One – Pattern #19



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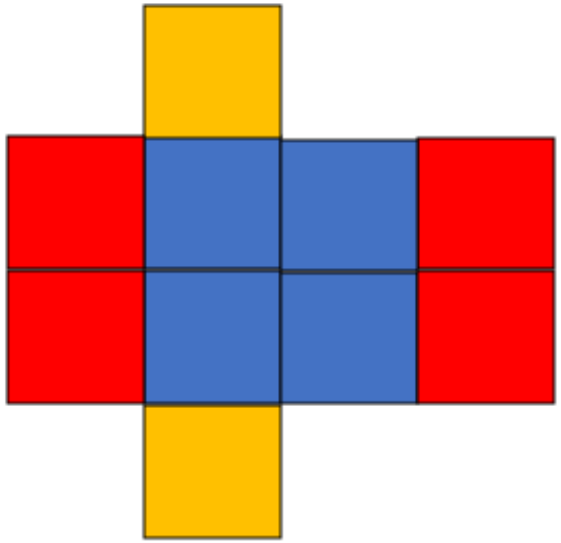


Figure 2

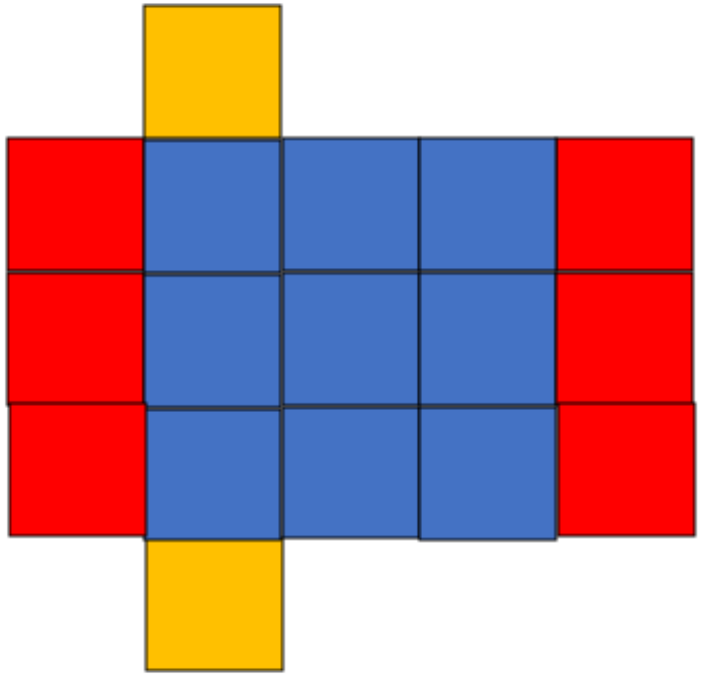


Figure 3

Different Directions

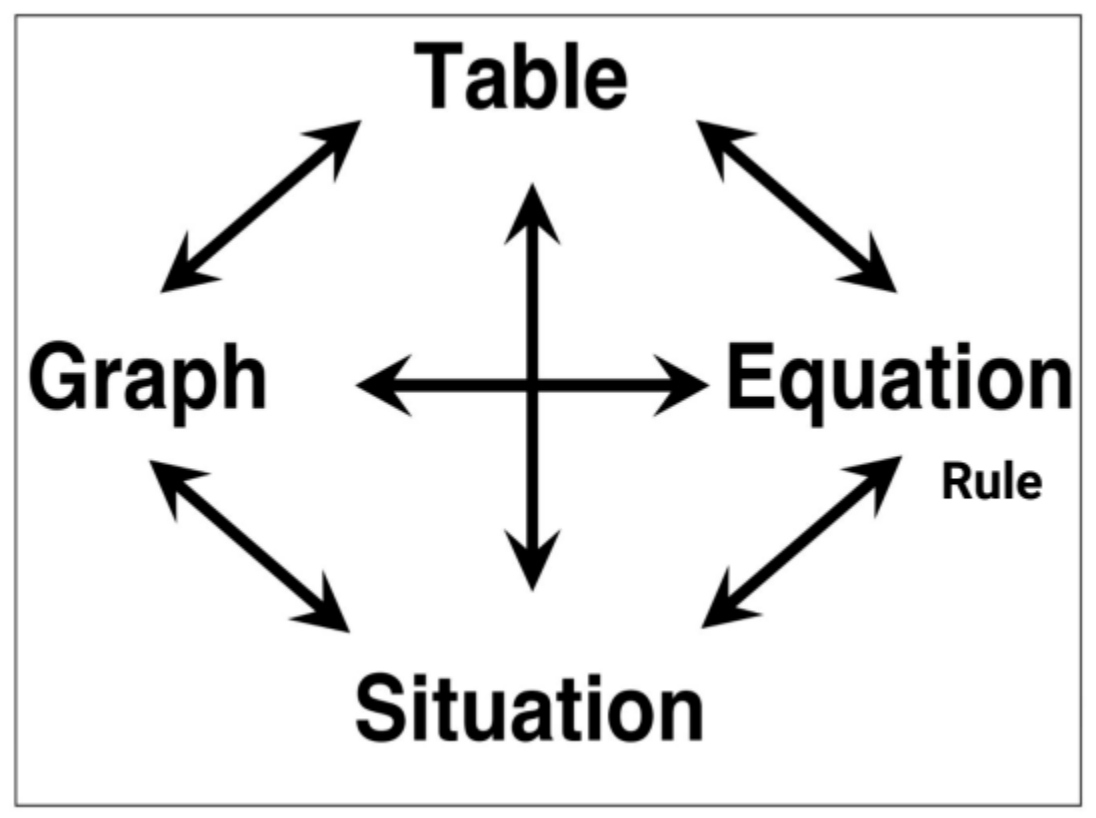
Just Getting Started

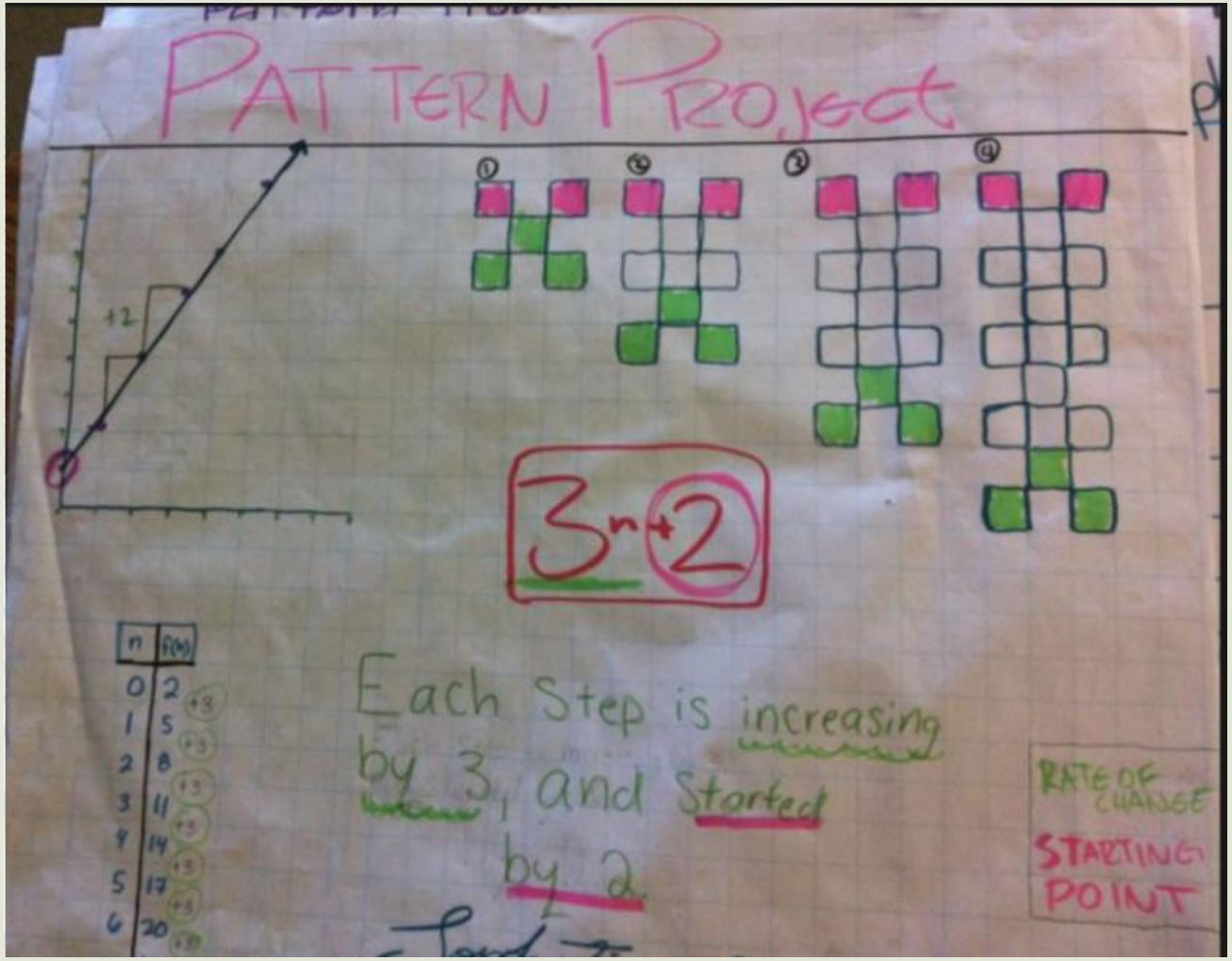
- Can start this routine as low as sixth grade classroom – even the quadratics
- The focus is on the visuals – save the tables and graphs for later!
- Push students towards generalizing by asking to describe higher number figures

Working Towards Standards

- Still keep the focus on the visuals!
- Depending on grade level: Equivalent Expressions, Connecting to tables and graphs, linear vs. quadratics vs. exponential growth
- Connecting patterns, tables, graphs and contexts together

Multiple Representations





Think, Pair, Share

Consider a big idea in your subject area. What tangible contexts might provide an entry point for students?

Feel free to work with a thought partner.

Additional Resources

Math Is FigureOutable, Pam Harris - https://www.mathisfigureoutable.com/

Building Powerful Linear Functions Workshop

https://www.mathisfigureoutable.com/motion

Motion Detectors (Calculator Based Rangers) - https://www.schoolmart.com/shop/texas-instruments-calculator-based-ranger-2/

Visual Patterns, Fawn Nguyen - https://www.visualpatterns.org/

Thank you!

Questions or Comments?

Slides will be posted to Sched

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brandon.pelter@gmail.com