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Young Mathematicians

STEM Skills for Success

Lindsey Herlehy

April 13, 2021



Webinar Presenter & Objectives:



Reflect on our own journey as a mathematician and understand the charge for early childhood educators in developing confident, proficient, and fluent math students



Examine the big ideas of early childhood mathematics and what they look like in a physical and virtual classroom.



Explore STEM applications that integrate early childhood foundational math concepts and skills

Lindsey Herlehy, NBCT

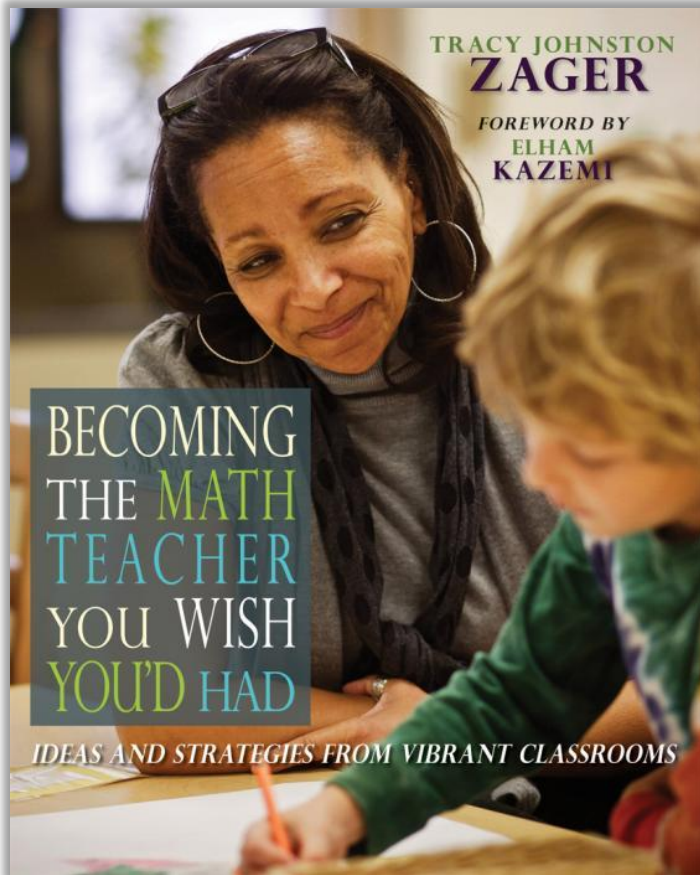
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What is your math story?

If you feel comfortable, you are welcome to share your experience in the Chat.

What is your math story?



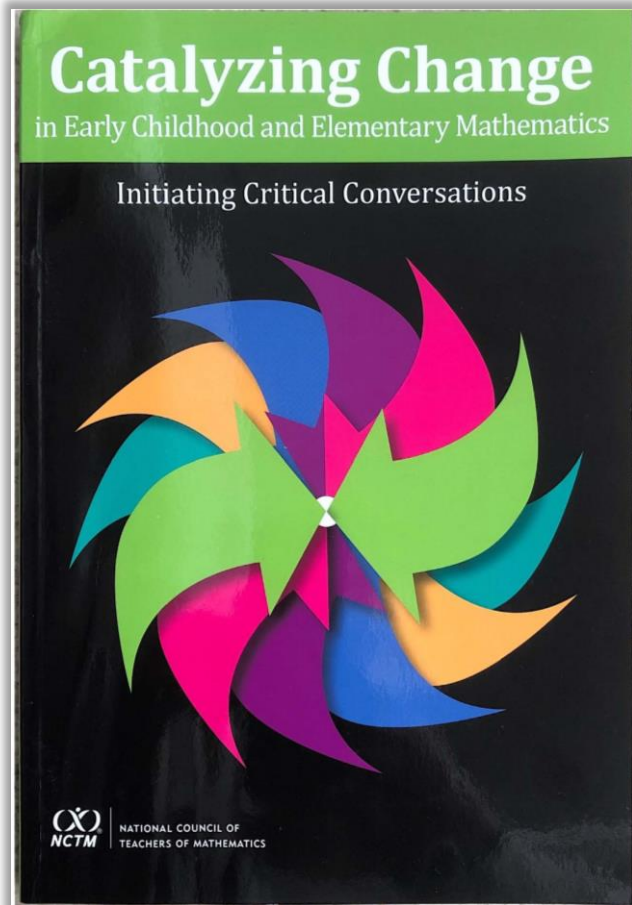
🧱 *"Math is when they hand you a sheet of paper, and it has a word problem you don't understand on it."*

🧱 *"Being good at math means you answer the teacher's questions fast, right, easily."*

🧱 *"Math is you can have these sheets of paper and it has math on the board. And also, math can be learning how to write sheets of paper."*

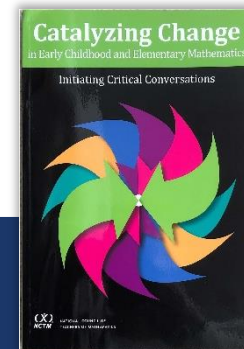
🧱 *"They thought the only way to learn math was to be taught it by someone who knew more, usually a teacher in school."*

What is your math story?



“Many children do not see themselves as mathematically capable or as doers of mathematics. When asked to draw what a mathematician “looks like,” children consistently draw the same character...pictures of old, disheveled bald White men wearing glasses, working alone, and writing equations on a board.”

So what do we do about this?



National Council of Teachers of Mathematics Key Recommendations

Broaden the Purposes of Learning Mathematics	Create Equitable Structures in Mathematics	Implement Equitable Mathematics Instruction	Develop Deep Mathematical Understanding
Each and every child should develop deep mathematical understanding as confident and capable learners; understand and critique the world through mathematics; and experience the wonder, joy, and beauty of mathematics .	Early childhood and elementary mathematics should dismantle inequitable structures , including ability grouping and tracking , and challenge spaces of marginality and privilege .	Mathematics instruction should be consistent with research-informed and equitable teaching practices that nurture children's positive mathematical identities and strong sense of agency .	Early childhood settings and elementary schools should build a strong foundation of deep mathematical understanding, emphasize reasoning and sense making , and ensure the highest quality mathematics education for each and every child.

The Foundations of Early Childhood Mathematics

Sets

Number
Sense

Counting &
Operations

Measurement

Patterns

Data Analysis

Space &
Shape



imsa.edu

Sets

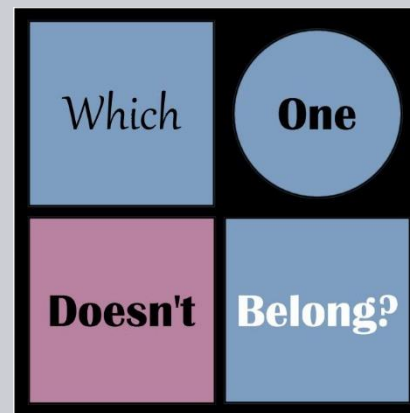
- Attributes can be used to sort collections into sets.
- The same collection can be sorted in different ways.
- Sets can be compared and ordered.

In the classroom...






Sorting Station

For remote learning...

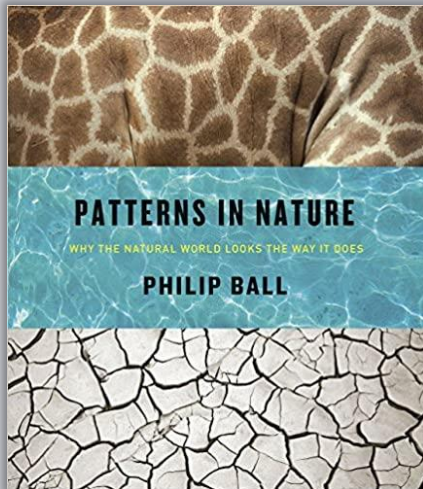


Which One Doesn't Belong?

Pattern

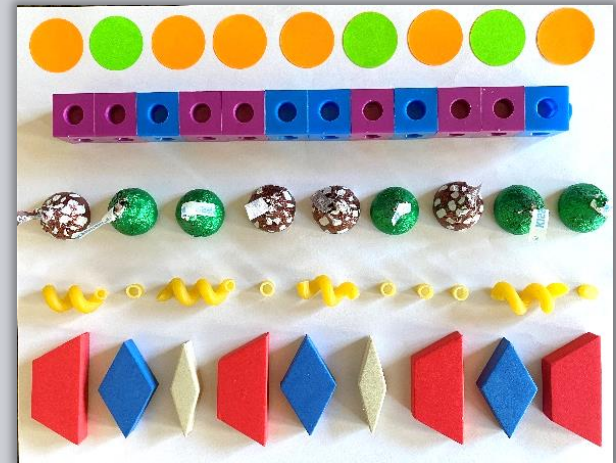
-  Patterns are sequences governed by a rule and exist in both the world and mathematics.
-  Identifying the rule of a pattern brings predictability and allows us to make generalizations.
-  The same pattern can be found in many different forms.

In the classroom...






Informational Text

For remote learning...



Where's the Error




Number Sense

-  Numbers are used in many ways, some more than others.
-  Quantity is an attribute of a set of objects and we use numbers to name specific quantities.
-  The quantity of a small collection can be intuitively perceived without counting.

What do you see?

Share your thoughts with the group using the Chat feature on your Zoom toolbar.

Number Sense

-  Numbers are used in many ways, some more than others.
-  Quantity is an attribute of a set of objects and we use numbers to name specific quantities.
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In the classroom...






Daily Activities

For remote learning...

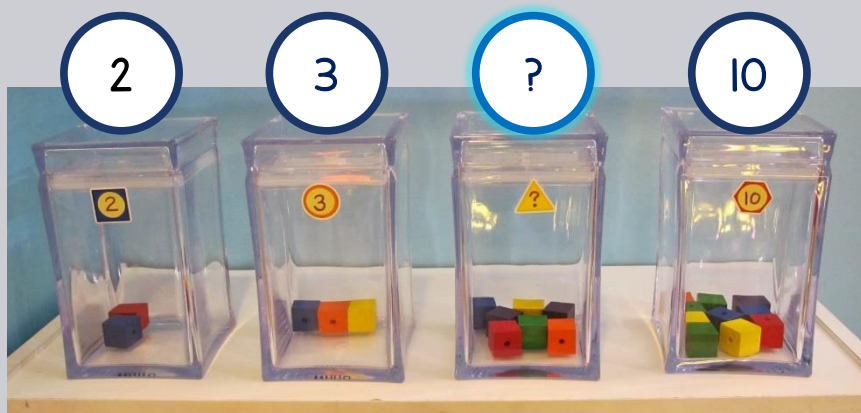


Card Games

Counting & Number Operations

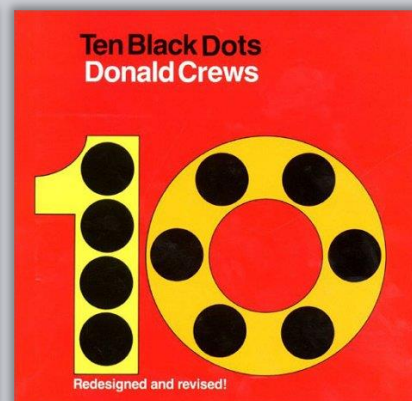
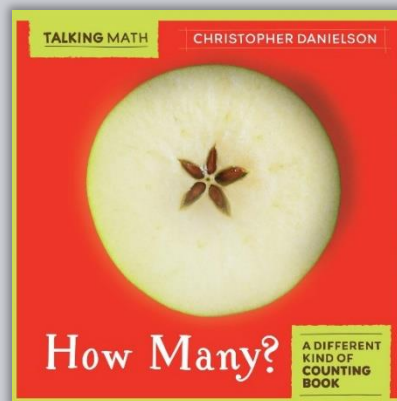
-  Counting has rules and can be used to find out “how many” in a collection.
-  Sets can be *changed* (joining or separating), *compared*, and *ordered*.
-  A quantity can be *decomposed* into parts; the parts can be *composed* to form the whole.

In the classroom...






Estimation Station

For remote learning...



Connection to Literature

Measurement

-  Many different attributes can be measured.
-  All measurement involves a “fair” comparison.
-  Quantifying a measurement helps us describe and compare more precisely.

In the classroom...






Using Non-Standard Tools

For remote learning...



Filling Station

Data Analysis

-  The purpose is to answer questions when the answers are not immediately obvious.
-  Data must be represented in order to be interpreted.
-  It is useful to compare parts of the data and draw conclusions about the data as a whole.

In the classroom...



Trends in Data






For remote learning...

- Would you rather...?
- What is your favorite...?
- Do you like...?

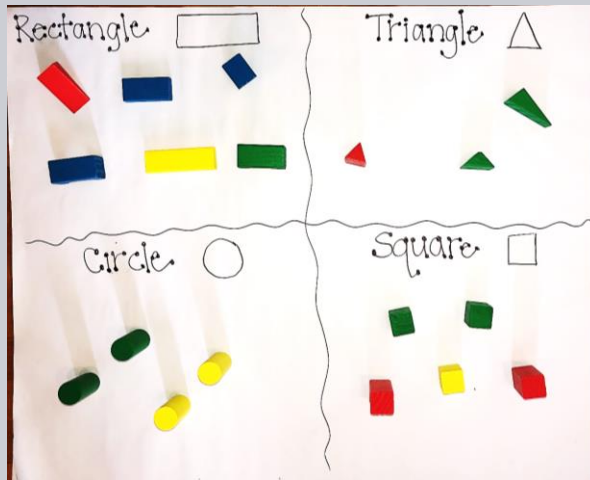
- Some questions can be answered with mathematics.
- Organizing information, using tally marks, asking more questions.
- Practice in public speaking.

Conduct a Survey

Spatial Relationships & Shape

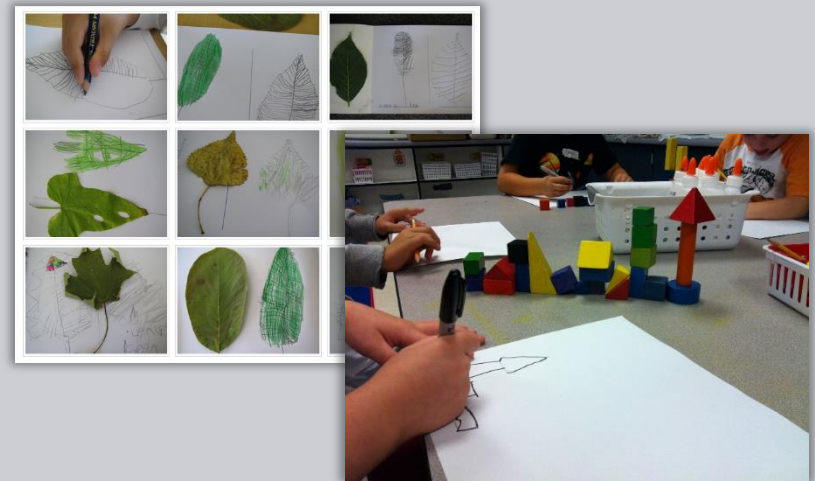
-  Relationships between objects and places can be described with mathematical precision.
-  Spatial relationships can be visualized and manipulated mentally.
-  Shapes can be defined and classified by their attributes.
-  The flat faces of solid shapes are two-dimensional shapes.
-  Shapes can be combined and separated to make new shapes.

In the classroom...



Sorting Blocks


For remote learning...




Observational Drawings


Resources

Professional Development Resources

 [Becoming the Math Teacher You Wish You'd Had](#) by Tracy Zager

 [Catalyzing Change in Early Childhood and Elementary Mathematics](#) by National Council of Teachers of Mathematics (NCTM)

 Erikson Institute's [Big Ideas of Early Math Website](#)

 [Big Ideas in Early Math: What Teachers of Young Children Need to Know](#) by Erikson Institute.

 [Building Math Minds](#) by Christina Tondevold

Manipulatives and Books

 [Virtual Manipulatives: Free Math Apps](#) from The Math Learning Center

 [Which One Doesn't Belong?](#)

 [Ten Black Dots](#) by Donald Crews

 [How Many?](#) by Christopher Danielson

 [Patterns in Nature: Why the Natural World Looks the Way It Does](#) by Philip Ball

 [Tiny Polka Dot Card Game](#)

 [Estimation Station](#) by PreKinders

 [Graphing by Attribute](#) by Erikson Institute

To download this presentation and available resources, navigate to:

<http://bit.ly/youngmathematicians>



To download free early childhood STEAM activities, navigate to:

<http://bit.ly/littlesteamers>

Instructional Book includes instructional pages for in-person and remote learning, all student pages, and standards (IL and MO). Student learning objectives, materials, and STEAM skills indicators are included. Units of study include Colors, Water, Simple Machines, Playing with Code, Buildings, and Animals.



Inclined Plane: Ramp Racing

Introduction

The inclined plane, or ramp, is one of six simple machines defined by Renaissance scientists. Consisting of a flat, tilted surface with one end raised higher than the other, the inclined plane is useful in raising or lowering loads. Through play, early childhood students often become familiar with ramps while playing with toy cars. In the following activity, students will extend their play with cars and ramps to consider how the angle of incline impacts the distance the car travels. In this activity, students will manipulate the angle (height) of the ramp during play while using basic counting and measurement techniques to quantify how their toy car travels.

Materials (work group of 2 to 4 students)

- 1 Toy car per student/partner team
- 1 set of Number Cards (from Levers-Catapult Launch) that match each toy car
- 1 Car Image and Ramp Numbers set that match each toy car
- 2 Flipper Dropper Ramps
- 2 Magic Wands (from Piral Moon)
- 1 set of Magnets to share
- 6 wooden blocks of a standard height (provided by teacher)
- Non-standard measuring tool of uniform length (see examples of Piral Moon)
- Construction hat and suit for each student

Learning Objectives

I can use materials to measure the distance my car travels down a ramp.

I can create an in what happens to ramp at different

Skills

- Maths
- Problem Solving
- Language
- Creativity

Questions and Prompts

It is suggested this activity begin with an opportunity for students to make connections

Levers-Catapult Launch

Materials

- Simple Machines Video: <http://bit.ly/littlesteamers/101114>
- Large mixing spoon (wood or plastic is best)
- Paper Towel or Toilet Paper roll
- Rubber Band
- Objects to launch
 - Marbles, cotton balls, wadded tissues, etc.
- Data Table (attached)

Learning Objectives

- I can build a catapult and use it to launch objects
- I can use my hands or feet to measure how far an object travels
- I can identify examples of simple machines in the world around me

Skills

- Math Skills
- Hand-Eye Coordination

Exploration

Begin this activity by watching the Simple Machines video on YouTube—levers are highlighted at the very beginning, around 4:07, and again at 9:43. After watching the video clips, ask students:

- What can you tell me about the levers in the video? Describe them.
- Were they all the same? What was similar or different about them?
- Have you ever used a lever? Tell me about it.

Next, tell students that they are going to build a catapult and use it to launch some objects. First, they will build the catapult and practice using it to launch their objects (building instructions attached).

Once ready, they will prepare the catapult the roll, or fulcrum, as close to the fulcrum as is possible (fulcrum position #1) other soft objects 5 times. They will use 1 or feet piece one to use throughout the measure how far the object traveled launch and record the data in the Data Table 5 successful launches, they will alternate by moving the fulcrum away from if the spoon (fulcrum position #2). Then they will complete 5 more successful launches, again,

Data Table: We're Going on a Wheel Hunt

Objects with 1 wheel (1)	Objects with 2 wheels (2)
Objects with 3 wheels (3)	Objects with 4 wheels (4)
Objects with 5 or more wheels (5+)	

Standards Index

Illinois Early Learning and Development Standards

Language Arts

LE.LS.1.8. Demonstrate understanding through age-appropriate measures

- Simple Machines Unit: Wheel & Axle: Where the Rubber Meets the Road, Pulley: Carry and Consume, Screw: Moan on Up, Wedge: Making the Cut
- Simple Machines Unit: Inclined Plane: On a Roll, Levers: Capsize Launch, Wheel & Axle: Where the Rubber Meets the Road, Pulley: Carry and Consume, Screw: Moan on Up, Wedge: Making the Cut
- Simple Machines Unit: Wheel & Axle: Where the Rubber Meets the Road, Pulley: Carry and Consume, Screw: Moan on Up, Wedge: Making the Cut

LE.LS.1.9. Use language to convey information and ideas

- Simple Machines Unit: Wheel & Axle: Where the Rubber Meets the Road, Screen: Moan on Up, Wedge: Making the Cut
- Simple Machines Unit: Inclined Plane: On a Roll, Levers: Capsize Launch

LE.LS.1.10. Share thoughts, feelings, interests, and reactions

- Simple Machines Unit: Inclined Plane: Ramp Racing, Levers: Capsize Launch, Wheel & Axle: Where the Rubber Meets the Road, Screen: Moan on Up, Wedge: Making the Cut

LE.LS.1.A. Demonstrate interest in objects and events

- Simple Machines Unit: Inclined Plane: Ramp Racing
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt, Pulley: Hoop Hoop Hoop

LE.LS.1.B. Recognize key words and details in stories

- Simple Machines Unit: Inclined Plane: Ramp Racing
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt, Pulley: Hoop Hoop Hoop

LE.LS.1.C. Demonstrate increasing awareness of and competence in emergent reading skills and activities

- Simple Machines Unit: Inclined Plane: Ramp Racing
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt, Pulley: Hoop Hoop Hoop

LE.LS.1.D. Demonstrate an emerging understanding of spoken words, symbols, and simple sentences

- Simple Machines Unit: Inclined Plane: Ramp Racing, Levers: Capsize Launch, Wheel & Axle: Where the Rubber Meets the Road, Screen: Moan on Up, Wedge: Making the Cut

LE.LS.1.E. Demonstrate growing fluency and confidence in oral communication

- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt

LE.LS.1.F. Use writing to represent and share knowledge

- Simple Machines Unit: Inclined Plane: Ramp Racing, Wheel & Axle: Where the Rubber Meets the Road, Screen: Moan on Up, Wedge: Making the Cut
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt, Pulley: Hoop Hoop Hoop, Screen: Moan on Up, Wedge: Making the Cut

Mathematics

MS.1.A. Demonstrate and apply a knowledge and sense of numbers, including numeration and sense of numbers

- Simple Machines Unit: Levers: Capsize Launch, Wheel & Axle: Where the Rubber Meets the Road, Pulley: Carry and Consume
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt

MS.1.B. Read and understand to create new numbers and begin to understand sets

- Simple Machines Unit: Levers: Capsize Launch, Wedge: Making the Cut
- Simple Machines Unit: Wheel & Axle: We're Going on a Wheel Hunt

MS.1.C. Begin to make approximate estimations of numbers

- Simple Machines Unit: Levers: Capsize Launch, Wheel & Axle: Where the Rubber Meets the Road, Wedge: Making the Cut



Questions?

Please complete the evaluation for this session. Thank you for your feedback!



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