



Learning Mathematics

by: Rachel Vasan



Why?



"I could never do that"

"I hate math"

"I'm just not good at math"



Theories

Constructivist Theory

- Children construct their own knowledge and understanding through their interactions with their environment
 - Reality is determined the experiences of the student
 - Students learn new things by building on previous knowledge that they had



Lev Vygotsky

- Russian Psychologist
- Social Constructivist
- Emphasizes the collaborative nature of learning
- Interaction with peers can be a form of learning



Zone of Proximal Development (Scaffolding)

- Student can work with someone else to complete a task they could not do on their own
- Then they can later do the task on their own
- Learning should build on previous learning so that the student is not presented with something too advanced



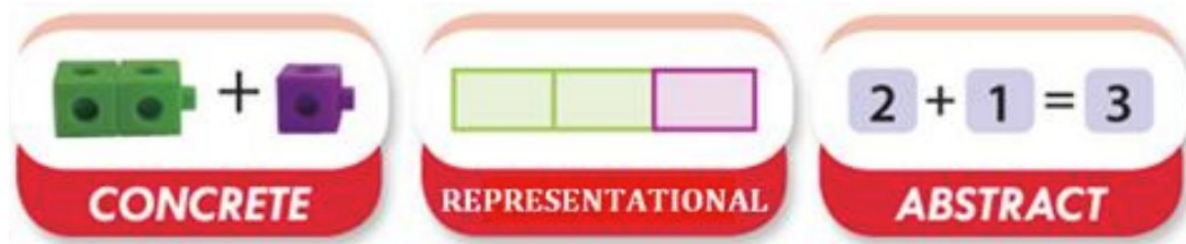
Mathematical Learning

- Paper by Barmby et al.
- Continuum where children build on a previous understanding
- Builds on Bruner
 - Spiral Curriculum
 - Introduce Topic and then Revisit it Later to Build on Previous Knowledge



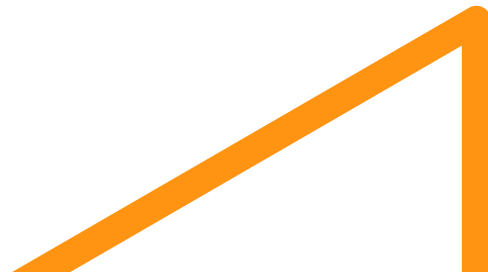
Bruner Continued

- Three Phases
 - Enactive Phase
 - Concrete
 - Iconic Phase
 - Models and Images
 - Symbolic Phase
 - Abstract Ideas and Way of Representing the Mathematics



ELPS by Liebeck

- Experience
 - Practical Experience
- Language
 - Language of Mathematics (Different)
 - Describing the Experience in Language
- Pictures (or Diagrams)
 - Representing Math Concepts as Pictures
- Symbols
 - Formal Writing of Mathematics



ELPS Example

- Experience
 - Counting Objects (for learning numbers)
- Language
 - Describing What is Being Counted or How Many Have Been Counted
- Pictures (Diagrams)
 - If 3 balls have been counted these can be represented through 3 pictures of the ball
- Symbols
 - Writing the number 3




Skemp

- Understanding Mathematics (Secondary Level) & Mathematics in the Primary School
- Two Ways of Understanding Mathematical Ideas
- Instrumental
 - Shallower Understanding
 - Using a set of steps
 - If you forget the steps you cannot replicate the procedure
- Relational
 - Understanding how the steps work





National & Primary Numeracy Strategy

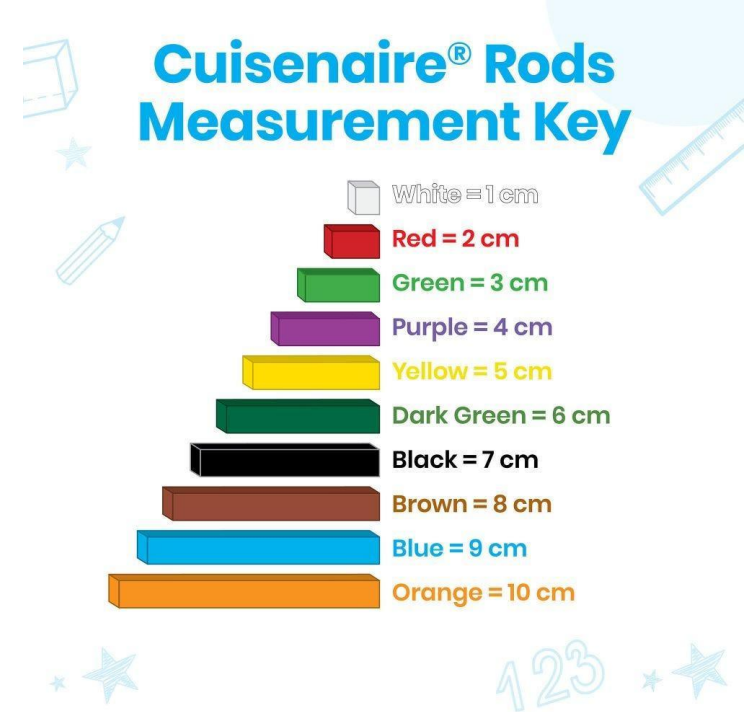
- Recommendations
 - “Real-Life” Problems
 - Meaningful Contexts
 - Real or Fictional
 - Give Children Choice
 - Builds Resilience
 - Helps with Problem Solving in Mathematics
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A person is climbing a red and green playground structure. The background is a brick building with many windows. A white circle is overlaid on the image, containing the text "Practical Methods".

Practical Methods

Physical Activity

- Helps Children Understand How to Turn Mathematical Ideas into Mental Images
- Objects
 - Interlocking Cubes
 - Bead Strings
 - Cuisenaire Rods



How does this apply to a word problem?

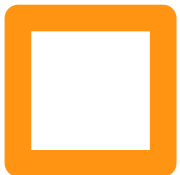
- Remove Information
- Headless
 - Remove Information Necessary to Solve Problem
 - Students need to determine what information they need
- Tailless
 - Students are asked to make observations about the information
 - Then create problems that could be solved with the given information

How does this apply to a word problem?

- Numberless
 - Understand the problem and how to solve it without the context of numbers
 - Teachers provide small amounts of information
 - Then numbers are added after

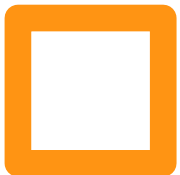
Example

- Neela is making rectangular place mats that are 12 inches wide and 15 inches long. What is the least amount of ribbon that she will need to create a ribbon border around 1 place mat?
- Headless
 - What is the least amount of ribbon Neela will need to create a ribbon border for a place mat?



Example

- Neela is making rectangular place mats that are 12 inches wide and 15 inches long. What is the least amount of ribbon that she will need to create a ribbon border around 1 place mat?
- Tailless
 - Neela is making 1 rectangular place mat that is 12 inches wide and 15 inches long.



Example

- Neela is making rectangular place mats that are 12 inches wide and 15 inches long. What is the least amount of ribbon that she will need to create a ribbon border around 1 place mat?
- Numberless
 - Neela is making rectangular place mats that have a length and a width. What is the least amount of ribbon that she will need to create a ribbon border around one place mat?





Variations By Country

United States

- Common Core
 - Use a Variety of Models to Demonstrate how to perform operations and solve problems
 - Kindergarteners
 - Count a Number of Objects (Spoken)
 - Name the Quantity
 - Write Numbers up to 20
 - Represent Addition and Subtraction

England

- Broad View of Mathematics
- Start Math at 4 when they first go to school
 - Playful Study Method
- Age 6
 - Fractions
- Practice Base Understanding
- Connected to Real Life

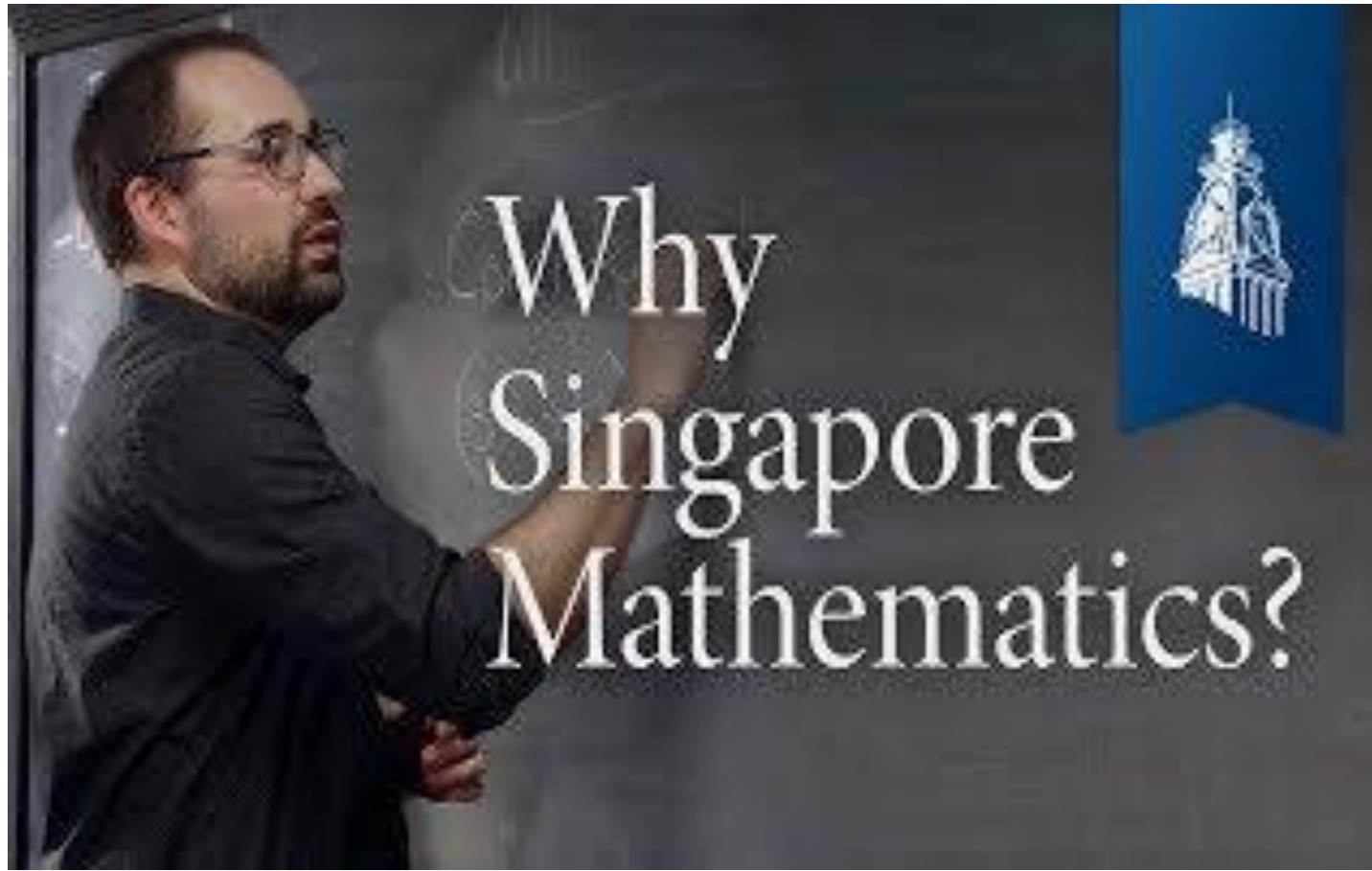
China

- Interactive Learning
 - Whole Class Participation
- Playful Explanations
- High Standards for Teachers

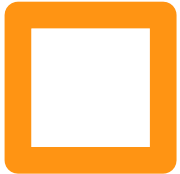
Singapore

- Main Goal: Joint Activity of the Teacher and Children
- Topic is developed through problem situations and Dialog
- Good at Developing
 - Communication Skills
 - Critical Thinking
 - Creativity

Singapore



Finland





My Opinions

Concluding Thoughts

