# Supports for Preschool STEM Learners and the Teachers Who Teach Them

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Kimberly Brenneman
National Institute for Early Education Research
Rutgers University

EC STEM Lab

# Mystery object

1. Describe this thing.  What do you observe?

2. What could you DO with this thing?  What could it be for?


Burgon & Ball


Burgon Ball

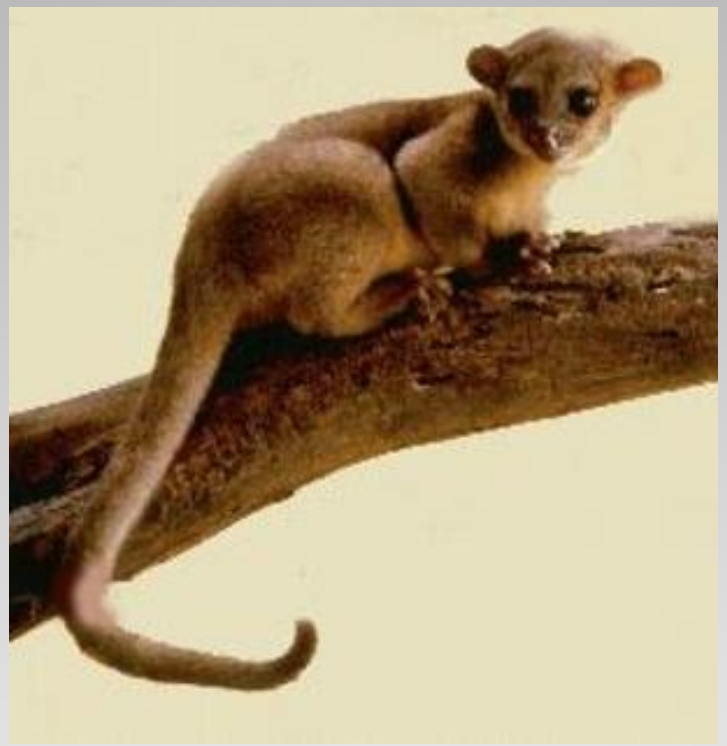
# Is this a “real” preschool science activity?

1. Were inquiry skills used?  Which ones?
2. How does it involve science, technology, and engineering concepts?
3. Would kids be able to do it?

Item 1: What do you want to know about this thing?

Item 2: What do you want to know about this thing?

Item 3: What do you want to know about this thing?



Item 4: What do you want to know about this thing?






- Preschoolers asked, *"What is it?"* for both unfamiliar animals and tools.
- They asked about *function* for artifacts.
- They asked about *category membership, food choices, and where it lives* for animals.
- Results suggest strong differentiation between the two categories.

**Greif, Kemler Nelson, Keil, & Gutierrez, 2006**






# Metal bowl + gravel -- Mess or ok?

That’s ok because it don’t got hoyos (holes).

Brenneman, Liberti, & Gelman (unpublished data)

# Metal colander + gravel?

No, no, that'd be good.
Not a mess.

Because this is more bigger. This is a little hoyos (holes). This is a biiiiig ooooone so put it in!

Brenneman, Liberti, & Gelman (unpublished data)

# SciMath-DLL Rationale

- Why focus on preschoolers?
- Why focus on DLLs?

What has not been studied is the extent to which rich math and science leads to improved readiness in these domains and in language and literacy outcomes for pre-K DLLs.

# Problems

- Very little math and science happens
- What does happen is low quality
- Teachers not prepared to teach STEM
- Negative attitudes

# Pre-K teachers deserve

- Recognition as professional *educators*
- Opportunities for PD that is
  - content-rich
  - sustained
  - individualized
  - collaborative
  - likely to be effective

# SciMath-DLL

Design, develop, and carry out preliminary testing of an innovative PD approach that integrates high-quality math and science instructional offerings with supports for preschool DLLs

# SciMath-DLL

- **Sample**: Educators in three state-funded, district-based pre-K programs in NJ
- **Description**: Three main components (workshops, reflective coaching, workgroups/PLCs), iterative development process
- **Progress**: 2013-2014 final year of study, positive impacts on teachers and coaches

# SciMath-DLL

"This project has … helped me to incorporate more science and math activities into my classroom. It also has helped me to view teaching in a different, more effective way. Instead of providing materials, activities, etc. for my students all of the time, I now see how important it is to also let the students explore, think, and problem solve on their own…."

- Teacher participant

# Our approach to early STEM

- Hands-on (usually)
- Rich use of language (teachers and children)
- Age-appropriate concepts that are relevant to children's lives and interests
- Research-based, standards-friendly activities
- Linked to children’s prior experiences
- Integrated, when appropriate (e.g., literature connections)
- “Thinking outside the kit”

# Example: Beyond biology in the garden

- **Focusing on FORM AND FUNCTION in the garden**
- **SG Learning Experience: Does It Hold Water?**
  - **STE concepts/skills:** Form & function, problem-solving
  - **Hands-on exploration:** The tool we usually use for a task (watering can) is missing. What can we use instead?
  - **Vocabulary:** water (*agua*), watering can (*regadera*), container (*recipiente*), problem (*problema*)
  - **Theme appropriate and relevant to children:** Children engage in flexible thinking about form and function as they consider whether various objects can be used to hold and carry water.

# Learning objectives

- engage in flexible thinking about the jobs different tools can do
- explore and describe properties of human-made objects
- explore ways that the shape, material, and form of objects relate to the jobs that they can do
- attend to and use attributes of objects and materials to make predictions or solve problems

# Discussion questions

1. In what ways does this activity support children's thinking about the T and E in STEM?

2. Other ways you could reinforce the learning objectives of this activity by engaging children in activities that involve containers?

# A few extensions

1. Some items hold water, but they aren't great for the job (carrying a distance) because of their size or material.  Encourage kids to compare two "holders" to find out which works better for the task.

1. Try pouring water from the good holders and carriers.  What features of an item make it work well for pouring?

# Connected learning experiences: Form & function in the garden

- Problem: need to move a heavy bag of soil
- Identifying the features of a “good” container; creating an unusual garden

# Preschool science learning experiences

- don't have to be experiments.
  - *I also think that I have broadened my thoughts on what activities are appropriate for my students.*
- can be simple – less is more.
  - *My first lesson, was a complete disaster because I had too much going on. I think sometimes, you overanalyze, and are too ambitious and the lesson was too much.*
- don't always yield the "right" answer or end result.
  - *Children are asking more how and why questions. They are experimenting more with materials without expecting a product.*
- don't always require lots of fancy materials
  - *Like for me I had too many materials, and the kids were overstimulated. After we talked about it, and I was like duh. The objective was there, the idea was there, the whole mapping it out, though was not.*
- should be connected.
  - *Teachers seem happy to discuss how their lessons turned out and are also ready to share their plans for extension/follow up.*

# Wish list for research, policy, & practice

- Stronger commitment to effective PD for STEM
- Compare effectiveness of various forms of PD in rigorous ways (BCA)
- Interdisciplinary PD – as good as science-only or math-only?
- More PD approaches that include both pre-K and elementary teachers (& TAs & administrators)
- Authentic research partnerships among educators, researchers, and funders
- Yours?