



## The Flowering STEM: Supporting STEM in children 0-3 and beyond

Dr. Eugene A. Geist  
Ohio University



Eugene Geist Ph.D.



Michael



## What is STEM?

- STEM is an acronym for Science, Technology, Engineering and Math.
- These fields are deeply intertwined in the real world and in how students learn most effectively.
- STEM is an interdisciplinary and applied approach that is coupled with hands-on, problem-based learning.

## Key Messages

- ① Caregiver comfort level with STEM concepts can influence his/her ability to support infant, toddler and preschooler's developing understanding of STEM subjects
- ② Children are born with intuitive thinking abilities and parents and caregivers can further assist their children's understanding through daily interactions
- ③ Adults facilitate early STEM learning through a variety of mediums such as active engagement with instruments, music and movement, sensory experiences, traditional building toys, and daily routines
- ④ Caregiver and parent engagement in experiences that support STEM concepts will promote school readiness in the first three to five years of life

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## Key Message #1

Caregiver comfort level with STEM concepts can influence his/her ability to support infant, toddler and preschooler's developing understanding of STEM subjects



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## Caregiver Attitudes

- Poor attitudes “rub off”
- Less math in the
- Gender stereotyping



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## Learned Helplessness

- 12 years of traditional schooling have taught us to:
- Assume the teacher has all the answers
  - Avoid risk of being wrong
  - See math as an solitary task
  - Expect instant validation
  - Value product over process

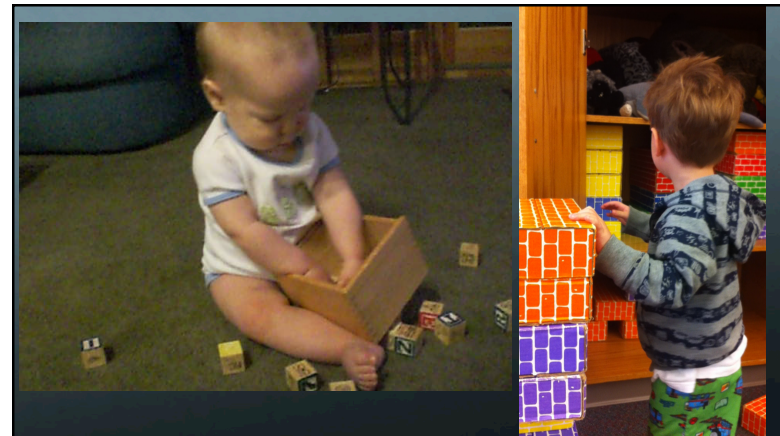
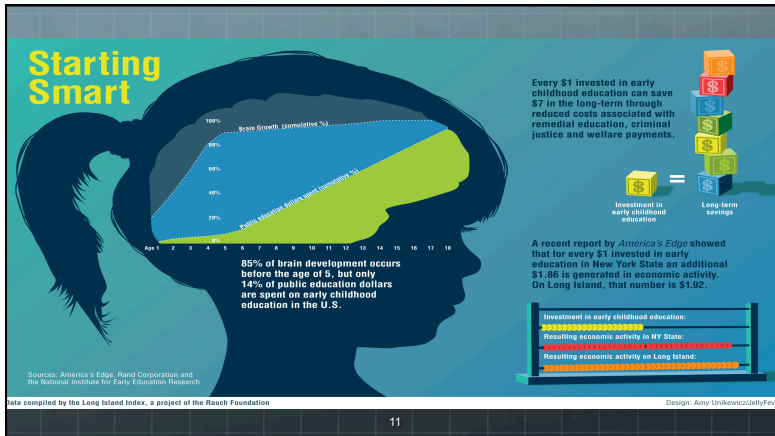
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# Brain teaser

- A man buys a horse for \$50 and then sells it for \$60. He then buys it back for \$70 and sells it again for \$80
- Did he make money or lose money and how much did he make or lose?

# Key Message #2

Children are born with intuitive thinking abilities and parents and caregivers can further assist their children's understanding through daily interactions



## What should we see?

- Children doing math independently
- Concepts developing without teaching
- A developmental sequence for learning math and mathematical concepts
- Beginnings of mathematics as early as infancy
- Children using math to make sense out of their world

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## Key Message #3

Adults facilitate early STEM learning through a variety of mediums such as active engagement with instruments, music and movement, sensory experiences, traditional building toys, and daily routines

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## What is STEM look like in 0-3?

STEM is about making relationships

- Comparisons
- Contrasts
- Number



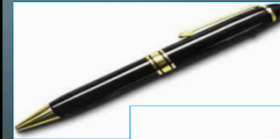
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## Types of Knowledge

- Physical
- Social
- Logico-mathematical



## Logico Mathematical Knowledge



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## Emergent Mathematics

- Create stimulating environments
- Recognize mathematical interactions in infants' and toddlers' every day lives
- Promote a child's natural ability to use math

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## It is not...

- Prescriptive
- About acquiring "skills"
- Recitation of "math facts"
- Coercive



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## Sample Activities

- 🌐 Rhythm and Music
- 🌐 Patterning
- 🌐 Blocks and Shapes
- 🌐 Classification tasks
- 🌐 Multiple classification
- 🌐 Everyday Activities and Routines
- 🌐 Manipulatives and Math Games



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## Patterning

- 🌐 Repeating patterns repeating sequences such as red, blue, red, blue.
- 🌐 Growing pattern such as “1, 2, 3, 4” or “2, 4, 6, 8”.
- 🌐 Relationship patterns links two numbers using some sort of function.

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## Math and Music

- 🌐 Beat
- 🌐 Rhythm
- 🌐 Tempo
- 🌐 Volume
- 🌐 Melody
- 🌐 Harmony



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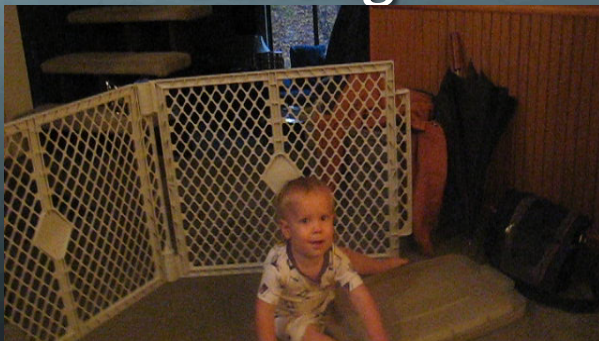
## Whistling



## Drumming



## Dancing



## Singing/ Rapping





## Games

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## Everyday Activities

- Taking turns
- Setting tables
- Distributing items  
(such as food items)
- Cooking
- Fantasy play



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## Technology



- “When it comes to the digital environment that permeates younger and younger children's lives today, we live in the age of the Jetsons. But when it comes to our understanding of the impact of ubiquitous digital habits on children's learning, our research enterprise is more like the Flintstones!”

## 2011 AVG Digital Skills Study

- (AVG, 2011; released in October 2010) found that while most small children age 2-3 can't swim, tie their shoelaces, or make breakfast unaided, they do know how to turn on computers, navigate with a mouse, play a computer game and operate their parents' smartphones.
- The study found that a quarter of 2-3 year olds know how to make a call on a mobile phone.
- 44% of them can play a computer game.



- Future college students of 2025 will not remember a time when there was not pad-based mobile devices and smart phones.
- Shuler (2009a, 2009b) suggests that mobile devices have significant potential to be a key ally in supporting learning experiences. They suggest that even with preschool children apps are unquestionably a new medium for providing educational content, both in terms of their availability and popularity.



## NAEYC and the Fred Rogers Center

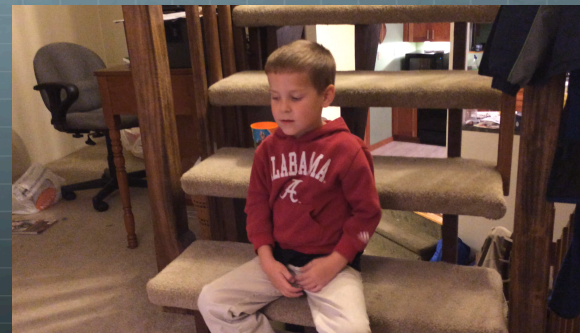
- When used inappropriately they (tech tools and media) have the potential to interfere with healthy child development and learning. How effective and appropriate technology is depends on...
  - Selection, use, integration and evaluation of technology tools and interactive media
  - Responsiveness to the age and developmental level of the child, individual readiness and interest
  - What is appropriate within the context of the families, cultures and community.

## Seymour Papert from 1988

- Seek out open-ended projects that foster students' involvement with a variety of materials, treating computers as just one more material, alongside rulers, wire, paper, sand, and so forth.
- Encourage activities in which students use computers to solve real problems.
- Connect the work done on the computer with what goes on during the rest of the school day, and also with the students' interests outside of school.
- Recognize the unique qualities of computers, taking advantage of their precision, adaptability, extensibility, and ability to mirror individual students' ideas and constructions of reality.
- Take advantage of such new, low-cost technological advances as temperature and light sensors, which promote integration of the computer with aspects of the students' physical environment.

Papert, S. (1988) Computer as Material: Messing About with Time. Teachers College Record in Spring 1988 (Volume 89, Number 3)

## M at 5 years



## Key Message #4

Caregiver and parent engagement in experiences that support STEM concepts will promote school readiness in the first three to five years of life



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## What Can You Do?

- 🌐 Interactions with children are vitally important
- 🌐 Be a facilitator.
- 🌐 Be an active observers of children's actions and explorations.
- 🌐 Provide appropriate materials and activities
- 🌐 Help children question their own assumptions

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## What You Can Do

- 🌐 Encourage children to think about and recognize relationships between objects
- 🌐 Provide appropriate materials and activities
- 🌐 Help children question their own assumptions
- 🌐 Encourage children to think about and recognize relationships between objects

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## Learning STEM is an Emergent Process!

- 🌐 Learning STEM begins at birth
- 🌐 STEM learning has a developmental sequence
- 🌐 STEM learning is linked to brain development
- 🌐 Interactions with STEM as infants and toddlers can promote later STEM concepts

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## Be a Facilitator

- 🌐 Infants and toddlers do not need flashcards or memorization
- 🌐 Use “math talk”
- 🌐 Let the child explain
- 🌐 Ask questions



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## Get out of the way

- 🌐 Don't over control
- 🌐 Don't push
- 🌐 Follow the child's natural progression
- 🌐 Give ample encouragement
- 🌐 Be a good role model

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## Wrap Up

"If children grew up according to early indications, we should have nothing but geniuses."

- Goethe



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## Questions





Thank You  
Eugene Geist  
Ph.D  
[genegelst@me.com](mailto:genegelst@me.com)

