



# Supporting Early Math Learning for Infants and Toddlers

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# Objectives

- 1** Relate school readiness to the development of early math and science concepts and skills.
- 2** Identify early math and science experiences that occur in everyday care routines and experiences.
- 3** Describe strategies for including early math and science concepts and skills in the daily routines, experiences, and play of infants and toddlers.

# News You Can Use: Math

## NEWS YOU CAN USE

October 2012

News for Head Start, Early Head Start, & Migrant/Seasonal Programs

### INSIDE:

Supporting Early Learning for Infants and Toddlers | Where is the Math?  
| Components of Math | Engaging Families | Conclusion

### SUPPORTING EARLY MATH LEARNING FOR INFANTS AND TODDLERS

**E**rvin holds Marshall, his six-month-old son, in his arms as he bottle feeds him during a home visit. Ervin shakes his head and says, "Marshall doesn't seem happy about drinking his bottle. He's drinking it slower than usual and he keeps playing with the nipple with his tongue. He was the same way this morning. He usually finishes his bottle pretty quickly!" Shelly, his home visitor, watches for a few moments, then asks, "Has something about his bottle feeding changed?" Ervin responds, "Not really. Feeding time, formula, and bottle are the same. Oh, but when I went to the store last night to buy new nipples, they didn't have the ones I usually get. So I got different ones. I put the new nipple on this morning. You don't really think he's noticing the different nipple, do you?" Shelly smiles and nods her head. She kneels on the floor in front of Marshall and says, "Marshall, I think we know why you're not happy. Your bottle has a new nipple! It's not the same as your old one. It has a different shape and it feels different in your mouth. You noticed something different about your bottle and you're letting us know you noticed!"



"Infants and toddlers begin to develop math concepts and skills in the first years of life."

Dani (11 months old) signs "more" after she finishes eating her banana slices. Will, her teacher, laughs and says, "You want more? Okay, I'll give you some more banana slices." He cuts up the rest of the banana, puts the slices in a bowl, and puts the bowl in front of her. She eats all of the banana slices. When the bowl is empty, Will signs and says, "All gone. Dani ate the whole banana. All gone!" He smiles at her and she smiles back.

Kamara (18 months old) sits on the living room floor and plays with an empty wallet and a small wooden block. Carol, the family child care provider, sits near her and watches. Kamara opens the part of the wallet that holds coins and tries several times to fit the block in it. Then she opens the part that holds bills and tries, without success, to fit the block in. Kamara looks over at Carol, who smiles and says, "You are trying to put the block in the wallet, but it doesn't seem to fit. What will you try next?" Kamara gets up and goes over to a low shelf that holds different types and sizes of bags. She selects a large canvas bag with handles and brings it back to where she was sitting. She picks up the block and drops it into the bag. Then she looks at the wallet, picks it up, and drops it in, too. She brings the bag to Carol and gives it to her. Carol claps her hands and exclaims, "Yay, you found something large enough to fit the block and the wallet!"

1

## STUDY GUIDE

### NEWS YOU CAN USE

#### FOUNDATIONS OF SCHOOL READINESS:

#### SUPPORTING EARLY MATH LEARNING FOR INFANTS AND TODDLERS

### SUMMARY:

This *News You Can Use* (NYCU) describes five components of math and provides suggestions for how to support early math learning for infants and toddlers.



### Key Messages:

- Even without adult support, infants and toddlers naturally use math concepts to make sense of their world.
- Adults use math concepts and math language in their own lives all the time, but may not realize it.
- Math for infants and toddlers involves five components: numbers and operations; shapes and spatial relationships (geometry); measurement; patterns, relationships, and change (building blocks of algebra); and collecting and organizing information (data collection and analysis).
- Being aware of early math concepts can help you be intentional in creating environments that support early math learning and in using "math talk" with infants and toddlers.



### Think:

- Math is considered part of the cognition and general knowledge domain. What are some ways that early math learning relates to the other domains—social and emotional development, approaches toward learning, language and literacy, and physical development and health?



### Reflect:

- Reflect back on your math experiences in school. How might those experiences affect how you support early math learning for infants and toddlers?
- Looking at your own activities, think about the ways you use math concepts and math language in your own daily life.



### Discuss:

- Discuss how early math learning might help infants and toddlers get ready for preschool and beyond.
- Share examples from your observations of how the infants and toddlers you work with use math concepts or math talk.



### Next Steps:

- Make a list of math talk words and phrases. Post a selection on the walls to help you notice math talk opportunities. If you go on home visits, bring the list with you to share with families to help them notice opportunities, too.
- Watch the webinar *Supporting the Intuitive Understanding of Early Math in Infants and Toddlers*, from the 17th Annual Virtual Birth to Three Institute. Listen for one or more new ideas to try or to share with a coworker or family.

# News You Can Use: Science

## NEWS YOU CAN USE

News for Head Start, Early Head Start, & Migrant/Seasonal Programs

May 2014

### INSIDE:

What Is Science? | The Scientific Process | Science Knowledge | Staff and Families Support Early Science | Science and School Readiness | Conclusion

### EARLY SCIENCE LEARNING FOR INFANTS AND TODDLERS

Have you ever heard people say, “Science for infants and toddlers? That can’t be right!” Or, “I don’t know how to do that?” Or even “Science is for older children”? Science learning may seem to be the stuff of high school and college students, but it all begins with infants and toddlers!



Science is not just a body of knowledge—it’s “a way of thinking and acting . . . a way of trying to discover the nature of things.”

### What Is Science?

Science is not just a body of knowledge—it’s “a way of thinking and acting . . . a way of trying to discover the nature of things.” Science learning at any age involves curiosity, exploration, and discovery. These come naturally to most infants and toddlers. Adults can help young children find answers to their questions and discover more about things that interest them. Do you do some of that already? If so, you’re helping them learn science!

### The Scientific Process

*Fifteen-month-old Jasper is exploring a basket of different kinds of balls that his home visitor brought with her. Jasper finds a large, rubber bouncy ball. He hands it to his mother, Adria, and says “Ball.” Adria says, “Yes, it’s a rubber ball. Drop it and see what happens.” Jasper drops the ball, and it bounces back up to his waist. He laughs in delight. Adria laughs too and says, “It bounced. You like that!” Then he finds a plastic ball and says, “Ball!” When he drops this ball, it just lands on the floor and rolls. He looks at his mom with wide open eyes. Adria smiles and says, “Uh, it didn’t bounce. You look surprised! Here, try this one,” and hands him a larger bouncy ball. He drops it and it bounces back up to his knees. Jasper spends some time going through the basket of balls, dropping each one (and sometimes throwing one to the ground) to see if it bounces.*

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## STUDY GUIDE

### NEWS YOU CAN USE

#### FOUNDATIONS OF SCHOOL READINESS:

#### EARLY SCIENCE LEARNING FOR INFANTS AND TODDLERS

### SUMMARY:

This *News You Can Use* (NYCU) talks about the scientific process and building science knowledge for infants and toddlers. It also provides strategies that adults can use to support early science learning.



### Key Messages:

- Infants and toddlers are natural scientists! They are curious and investigate to find out more about their world.
- The scientific process (also known as the scientific method) is a series of steps for exploring questions and discovering answers. It is the “how” of science exploration.
- Science knowledge is the “what” of science exploration. It includes learning about physical science, natural science, and social science.
- Early science learning is related to developmental domains and school readiness.
- There are many ways adults can help young children find answers to questions and discover more about things that interest them.



### Think:

- This NYCU provides some examples of how early science learning relates to two developmental domains: (1) approaches toward learning and (2) cognition and general knowledge. What are some examples of how early science learning relates to social and emotional development, language and literacy, and physical development and health?
- How do engaging in the scientific process and learning about physical, natural, and social science help infants and toddlers become ready for preschool and beyond?



### Reflect:

- Reflect on your own experiences with science learning in school. Were they positive or negative? Can you say why?
- How might your personal feelings about science affect how you support early science learning for infants and toddlers?



### Discuss:

- How might early science learning look the same or differently for young infants, older infants, and toddlers?
- In what ways do you already support early science learning for infants and toddlers?



### Next Steps:

- Read one or more of the following NYCU editions: *Take It Inside* (January 2012); *Take It Outside* (January 2012); and *Outdoor Spaces* (March 2012). Look for a new early science learning idea to try with the infants and toddlers you work with.
- Plan ways to share what you know about the scientific process and science knowledge with families. Work with families to find ways they can support their child’s early science learning at home.

# Standards



Photo courtesy of EHS NRC

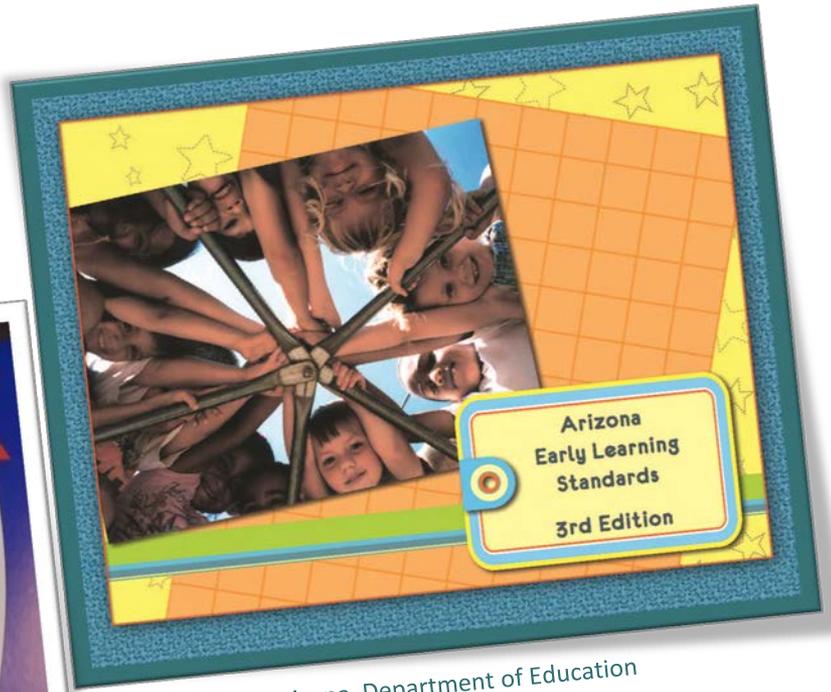


Photo courtesy Arizona Department of Education



# Five Essential Developmental Domains For Birth to Five



# School Readiness for Infants, Toddlers, and Their Families

## The child's developing capacity to

- Self-regulate
- Develop close, secure personal relationships with adults and peers
- Demonstrate curiosity in, pay attention to, and explore people and objects in the environment
- Demonstrate a sense of self-confidence
- Communicate effectively



Photo courtesy of EHS NRC



# What Is Math?

Mathematics (or math) is “a way of describing the world—a way of thinking, knowing, and problem-solving.”

Virginia’s Early Childhood Development Alignment Project, Milestones of Child Development: A Guide to Young Children’s Learning and Development from Birth to Kindergarten, 2008

# Where's the Math?



Videos courtesy of EHS NRC

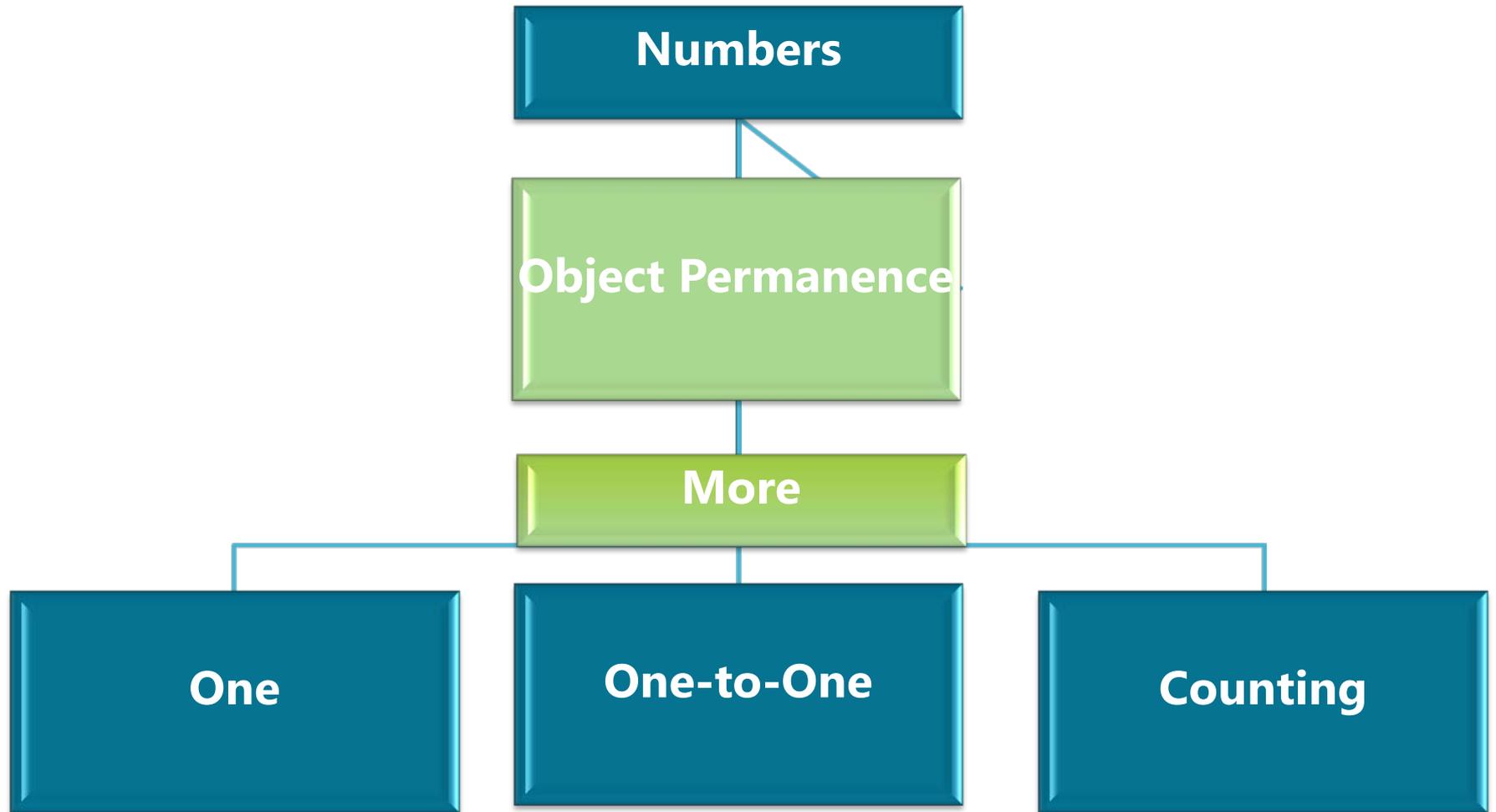
# To count objects accurately, children must...



Photo courtesy of *High Five Mathematize*, pg. 28

- Know the number word sequence.
- Label each object with a number word (one-to-one correspondence).
- Keep track of the objects that they have counted.
- Know that the last number counted is the total number of objects in the group (cardinality).

# Fundamental Concepts - Numbers



# Fundamental Concepts – Pattern, Reasoning, Algebra

**Sorting**

**Classification**

**Patterns**

**Sequence**

**Seriation**



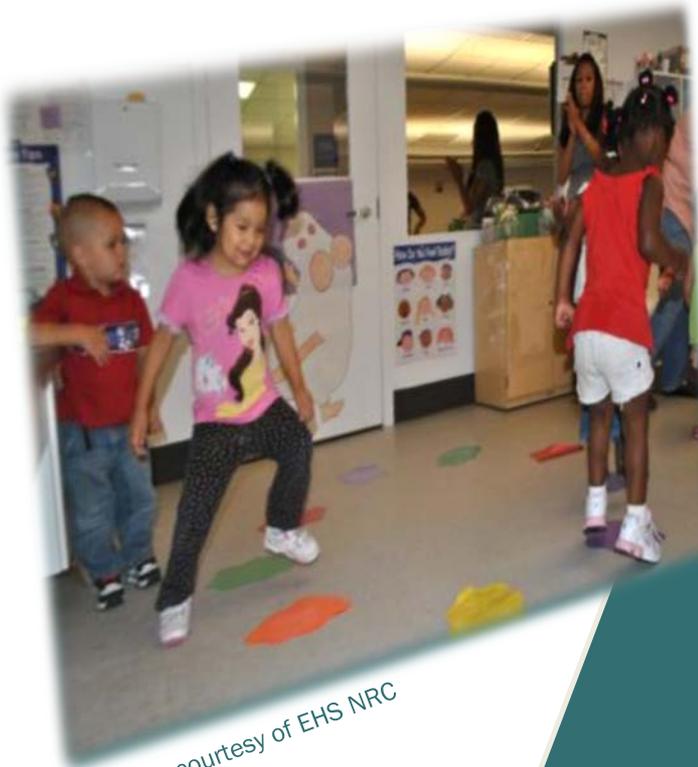
Photo courtesy of EHS NRC



# Instructions

- Review the definition of the concept.
- Using the toys provided, demonstrate your understanding of the concept.
- Discuss ways that infants and toddlers demonstrate their understanding of the concept.

# Fundamental Concepts - Measurement



Photos courtesy of EHS NRC

**Distance**

**Measurement**

**Size  
Comparison**

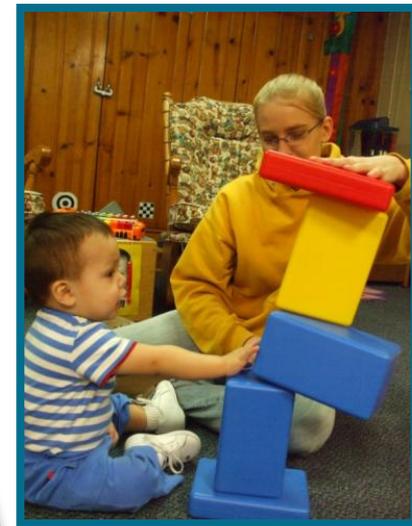


# Fundamental Concepts – Geometry and Shapes

Matching



Stacking



Photos courtesy of EHS NRC

# Goals and Next Steps

## School Readiness Goals for Infants and Toddlers:

Children will learn and begin to use math concepts during daily routines and experiences.

Individual Child Goal: Geneva will demonstrate her understanding of shapes and spatial relationships.

### Next Step Now?

Geneva will explore toys and materials to gain a sense of shape and how objects do and do not fit together.

### Ready at 3?

Geneva will complete simple board puzzles independently.

### Ready for School at 5?

Geneva will use positional words such as next to, above, below, etc. to explain the spatial relationships among items.



# What Is Science?

Science is a methodical process which seeks to determine the secrets of the natural world by using the scientific method.

<http://www.uic.edu/classes/bios/bios100/labs/scimethod.htm>

# My picture of science for infants and toddlers looks like...

Select the photo that best represents your vision.



Photos courtesy of EHS NRC

# Scientific Process of Infants and Toddlers

## Rain Stick



## Dirt Experience



Videos courtesy of EHS NRC



# More Science!

## Exploring Objects



## Sink or Float



Videos courtesy of EHS NRC

# Developmental Milestones

- Object Permanence
- Causality
- Spatial Awareness

August 2013

## NEWS YOU CAN USE

News for Head Start, Early Head Start, & Migrant/Seasonal Programs

**INSIDE:**

Math Concepts | Investigating | Connecting Experience and Info | Conclusion

**FOUNDATIONS OF SCHOOL READINESS SERIES: COGNITION AND GENERAL KNOWLEDGE**

Have you picked up a cup an infant dropped on the floor over and over again? Watched a toddler back up slowly and carefully to try and sit in a doll-sized chair? Or had ALL of the children interrupt a story about a dog to tell you about their experiences with dogs? While these experiences may sometimes be funny or frustrating, they involve serious effort for very young children. These children are intensely exploring the world around them. They are taking on the challenging task of understanding how things work. They are developing their abilities in cognition and general knowledge.



“...children are intensely exploring the world around them...taking on the challenging task of understanding how things work.”

**Cognitive development** for infants and toddlers is “the process of growth and change in the intellectual/mental abilities such as thinking, reasoning, and understanding.”

**General knowledge** can be thought of as information that babies and toddlers gain from their physical environments (home, neighborhood, and community) and their social environments (interactions with important adults, experiences they have, and the culture around them). Infants and toddlers use all their senses to gain this knowledge.

*In This News You Can Use, we explore some vignettes about cognition and general knowledge as they relate to school readiness goals. (See School Readiness Goals for Infants and Toddlers in Head Start and Early Head Start Programs.)*

Cognition and general knowledge, much like all infant and toddler learning, are closely tied to growth in other developmental domains. For example, to be successful in their developing abilities to think and learn, infants and toddlers need a strong foundation in social and emotional development. They need nurturing adults who respond to their needs and support their interests to feel safe and secure in exploring their environment. Additionally, physical development often coincides with leaps in cognition and general knowledge. For example, think of an infant who learns to pull up to stand; suddenly, a whole new world is visible to him! He is now capable of learning new things about gravity (as he sweeps things off tables) and how his body moves in space. As children explore and discover the world around them, they need adults to describe their experiences in order to extend

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Photos courtesy of EHS NRC

# Scientific Method: Six Components

Observation = Question

Develop Hypothesis = Make Educated Guess

Experiment

Analyze Results

Communicate Results

Modify and Repeat



Photo courtesy of EHS NRC

Every baby  
knows the

# scientific method!

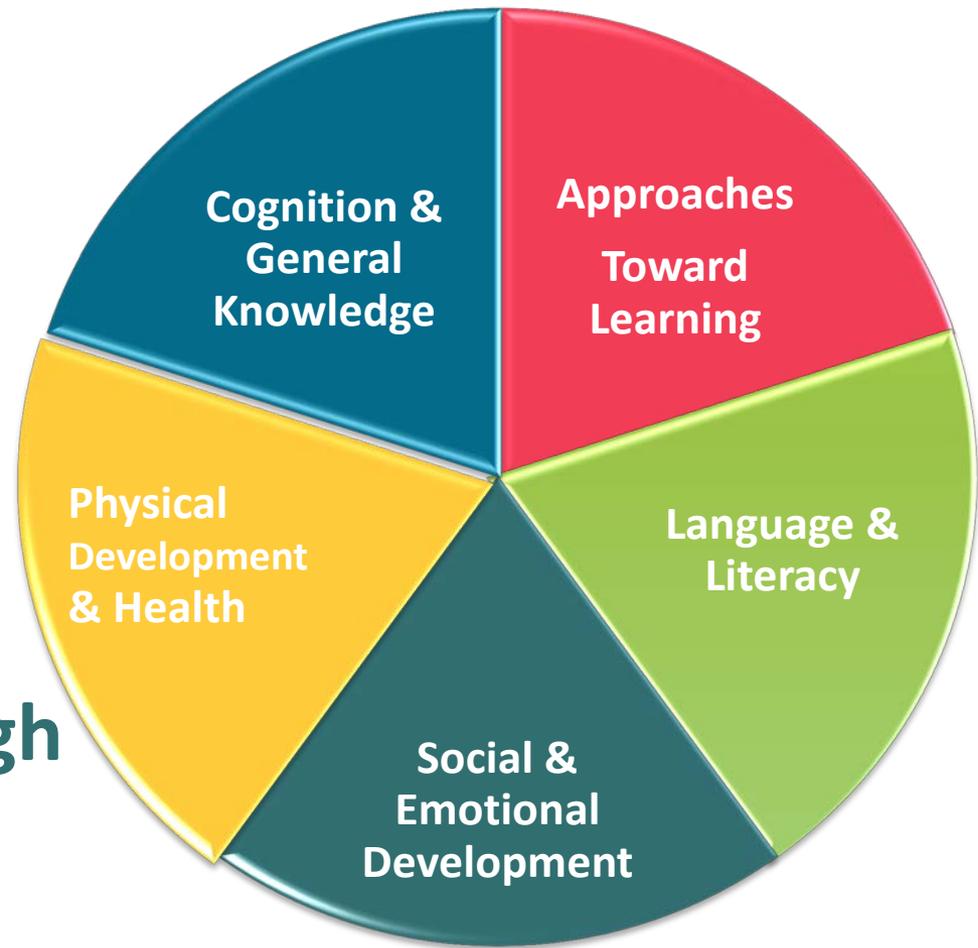


## Another Way to Think About the Method!



# Scientific Method of Infants and Toddlers

- Self-regulation
- Attention
- Curiosity
- Information gathering
- Memory
- Persistence through frustration
- Problem solving



# Scientific Method: Approaches to Learning

**Observation = Question**

**Develop Hypothesis =  
Make Educated Guess**

**Experiment**

**Analyze Results**

**Communicate Results**

**Modify and Repeat**

**Curiosity**

**Attention**

**Information Gathering**

**Persistence Through  
Frustration**

**Memory**

**Problem Solving**

# Problem Solving



Photos courtesy of EHS NRC





# Goals and Next Steps

## **School Readiness Goal for Infants and Toddlers:**

Children will use all of their senses to investigate their environment to discover what objects and people do, how things work, and how they can make things happen.

Individual Goal: Jimena will use multiple ways to solve problems and investigate her environment.

### Next Step Now?

Jimena will try various ways to remove an object that is stuck inside another object. For example, use tongs or turn the toaster upside down.

### Ready at 3?

Jimena will try different ways to stack blocks so they don't fall. For example, try various sizes of blocks on the bottom of the stack to see which ones work better.

### Ready for School at 5?

Jimena will ask questions to gather information to solve a specific problem. For example, "do you see any more pieces that go on the outside of my puzzle?"

# Exploring Science Concepts



Photo courtesy of EHS NRC

# Scientific Concepts

1. All things have properties.
2. There are living and nonliving things.
3. I can cause things to happen.



Photo courtesy of EHS NRC

# Science Experiences

## Social Science

- Humans

## Natural Science

- Animals
- Plants
- Environment
- Weather
- Air
- Rocks

## Physical Science

- Magnetism
- Gravity
- Machines
- Light
- Sound
- Water



Photos courtesy of EHS NRC

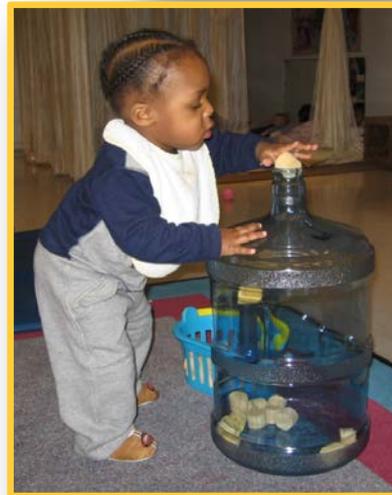


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# Science for Infants and Toddlers

## Develops through the senses

1. Vision
2. Touch
3. Taste
4. Hearing
5. Smell



Photos courtesy of EHS NRC

# Supporting Math and Science in Everyday Routines and Experiences



Touch



Taste

Vision

Hearing



Smell



Photos courtesy of EHS NRC

Photo courtesy of Microsoft®



# Supporting Early Math and Science in Everyday Experiences

On the chart paper, identify everyday routines and experiences you would use to help infants and toddlers develop early math and science concepts and skills.

# Summary



Photos courtesy of EHS NRC

- Children are natural mathematicians and scientists
- There are many opportunities during the day for children to discover math concepts through play and exploration and to hear new math words.
- You play an important role in nurturing children's early math learning!



# Supporting Early Math Learning for Infants and Toddlers

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Selected Resources from the EHS NRC

<http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/ehsnrc/>

- *News You Can Use: Supporting Early Math Learning for Infants and Toddlers*
- Supporting the Intuitive Understanding of Early Math in Infants and Toddlers (vBTT webinar)



# Supporting Early Math Learning for Infants and Toddlers

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Additional Resources from the NCQTL

<http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/practice/curricula/MKandS.html>

- Mathematics Knowledge and Skills Toolkit for Teaching
- High Five Mathematize (for infants, toddlers, and preschoolers) - see "Selected Resources" under "Know/Read About It"



# Supporting Early Science Learning for Infants and Toddlers

## Selected Resources from the ECLKC

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News You Can Use: Early Science Learning for Infants  
and Toddlers

<http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/ehsnrc>

Nature Based Learning and Development

<http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/eecd/nature-based-learning>