Playful, Inclusive, and All Day Long: STEM for Each and Every Child

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STEMIE2 INNOVATION FOR INCLUSION IN EARLY EDUCATION

UNC FRANK PORTER GRAHAM CHILD DEVELOPMENT INSTITUTE

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Introduction

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Who Is Here?

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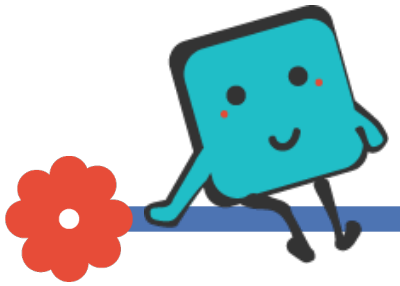
Housekeeping

- One hour session
- Use Zoom ‘raise hand’ tool
- Ask questions!
- Unmute!
- Use cell phone camera to scan resource QR codes
- Use chat box

Image from https://spotme.com/blog/virtual-event-planner/



Participants will:

1) Describe why it is important to practice inclusion and the importance of inclusion for each and every child,

2) Identify and apply practices and strategies to increase accessibility and participation for children with disabilities in playful STEM learning, and

3) Describe and apply a process for starting with children's thinking and interests, and planning for and implementing inclusive playful learning experiences.

Strategies Shared During This Session are Aligned to NC Foundations

Approaches to Play and Learning (APL)

Language Development and Communication (LDC): Learning to Communicate

- Goal LDC-3: Children ask and answer questions in order to seek help, get information, or clarify something that is not understood.
- Goal LDC-7: Children respond to and use a growing vocabulary.

Cognitive Development (CD): Construction of Knowledge: Thinking and Reasoning, Mathematical Thinking and Expression, and Scientific Exploration and Knowledge

What We Know

Children can develop the foundations for STEM learning right from infancy

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Importance

Engaging in early STEM learning activities raises later reading, writing, literacy, and math scores.

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STEM Opportunity Gap

Children with developmental delays and disabilities are especially denied opportunities to learn STEM.

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Let’s Take a Test!

Question 1: Think about your own practice...

How often do you recognize the strengths, needs, interests, and abilities of children with disabilities?

How often do you recognize children's thinking? Or, notice a child's interests (e.g., toys, materials, activities, people) during everyday activities?

Question 2: Think about your own practice...

How often do you follow the lead of children with disabilities while he or she is engaged in everyday activities?

How often do you focus on what a child with a disability can do?

Question 3: Think about your own practice...

How often do you provide necessary supports, accommodations, or adaptations to maintain child engagement in activities?

How often do you make targeted modifications to the environment, materials, and instruction based on individual child goals and outcomes?

Question 4: Think about your own practice...

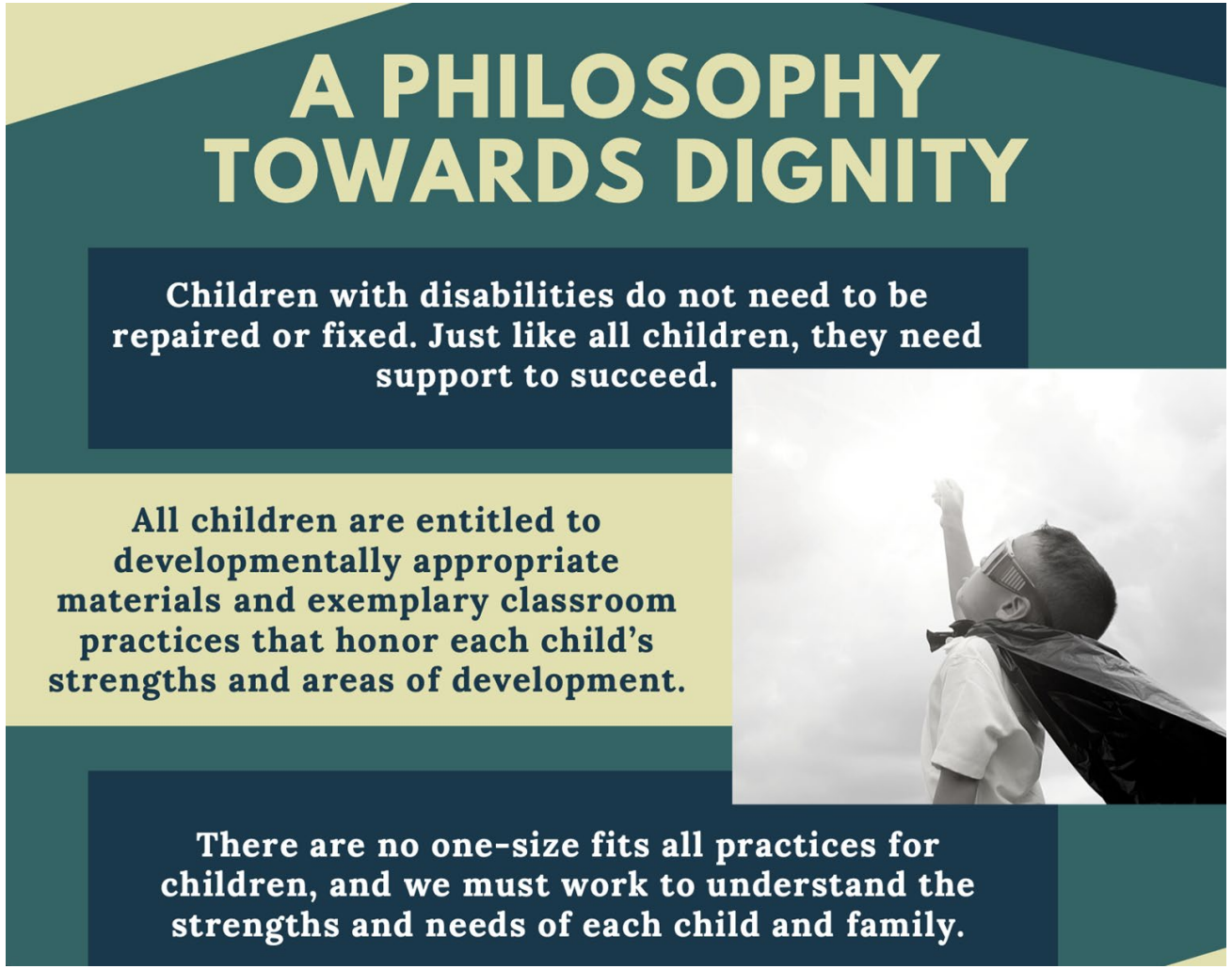
How often do you respond positively to a child's attempts to repeat or practice the same behaviors or to try something new and different, during STEM experiences? How do you embed STEM with early literacy?

How did you do?

- Did you do this for some children? All children, including children with the most significant needs or who have historically been underserved?
- Thoughts?

Dignity and Disability

Barton Lab Resource on Dignity and Disability



“All children have the right to equitable learning opportunities that enable them to achieve their full potential as engaged learners and valued members of society”.

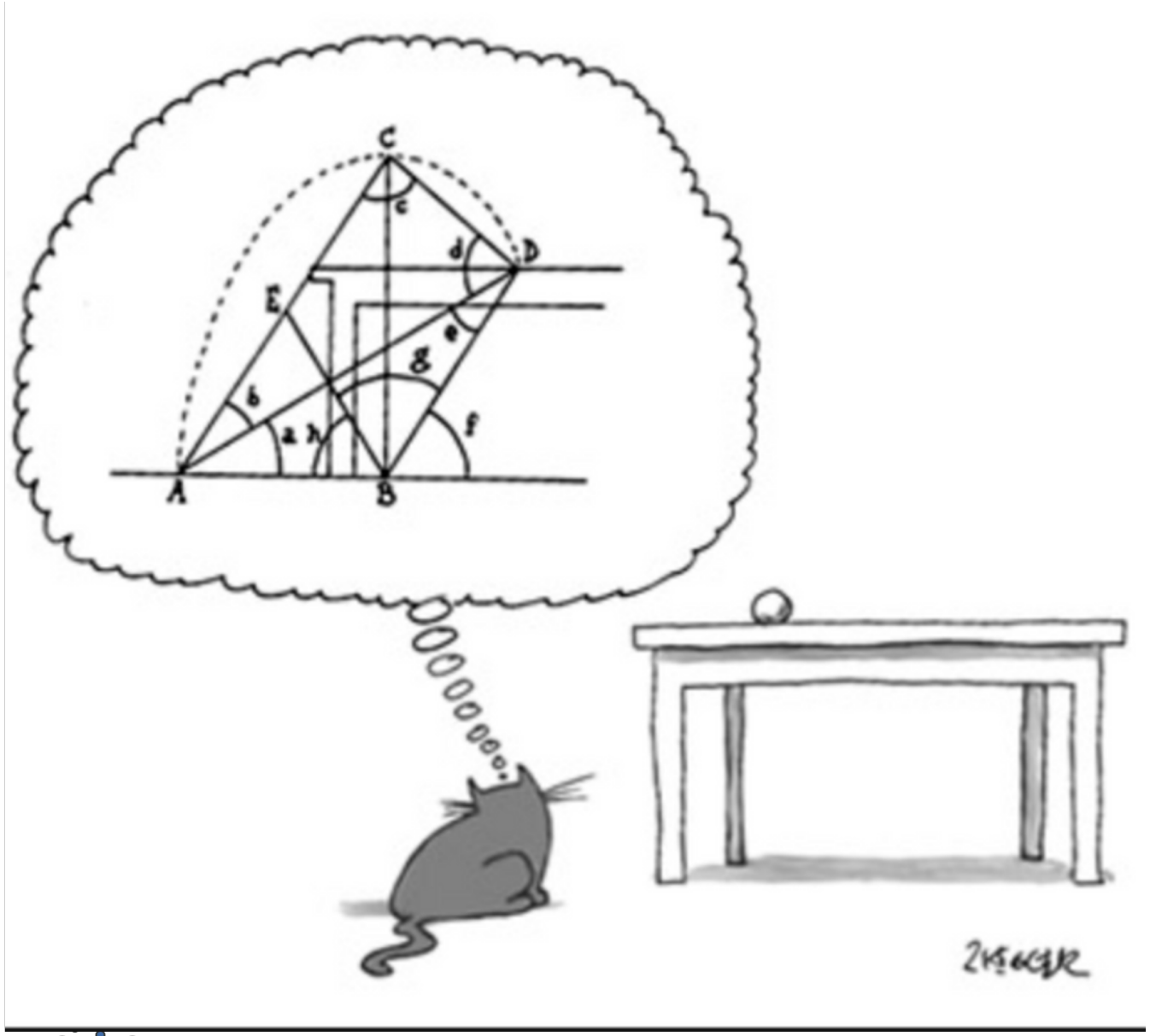
~NAEYC Advancing Equity in Early Childhood Education

Developmentally Appropriate Practice

"Methods that promote each child's optimal development and learning through a strengths-based, play-based approach to joyful, engaged learning."

https://www.naeyc.org/resources/position-statements/dap/definition

Where and how do we get started?



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Presume Competence

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Why Learning Trajectories

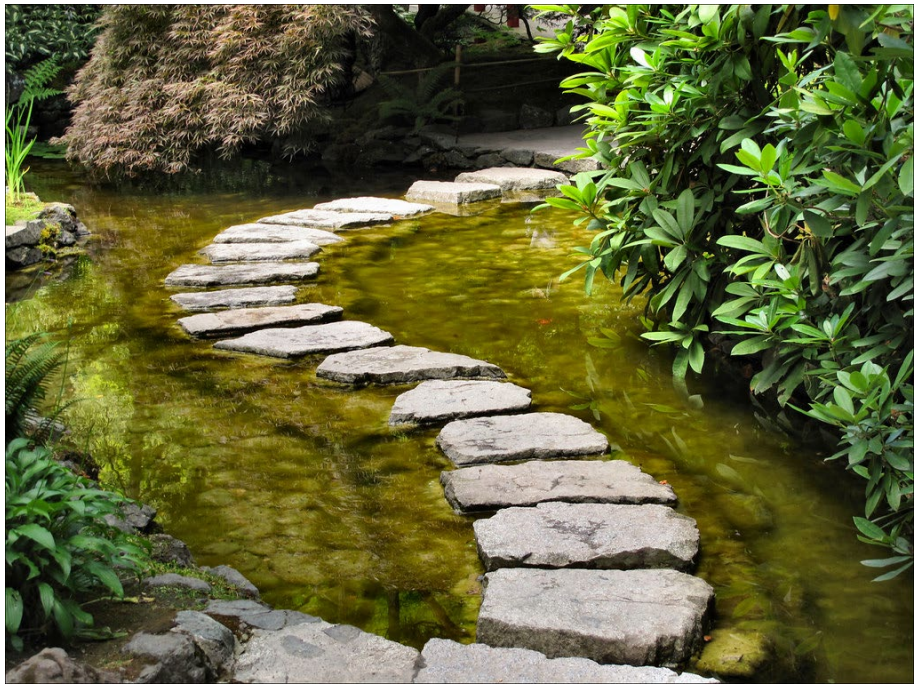
“Any good teacher starts with where the child is. Then, the obvious question is: how do you identify where a child is going? You have to have an idea of the path, the road or trajectory, through which children develop these math/STEM ideas…”

Doug Clements

Starting with children’s thinking

- Children's thinking follows a path or *developmental progression*

- Foundational levels to more and more sophisticated ways of thinking as the path moves ahead



Learning trajectories approach

Where is the child on the path?

- Observe carefully
- Really pay attention to what kids do, say, communicate in all ways
- New lens!

Strengths-based!

It’s about what children CAN do

Noticing HOW children are thinking is more critical and helpful than knowing if they got the ‘right’ answers.

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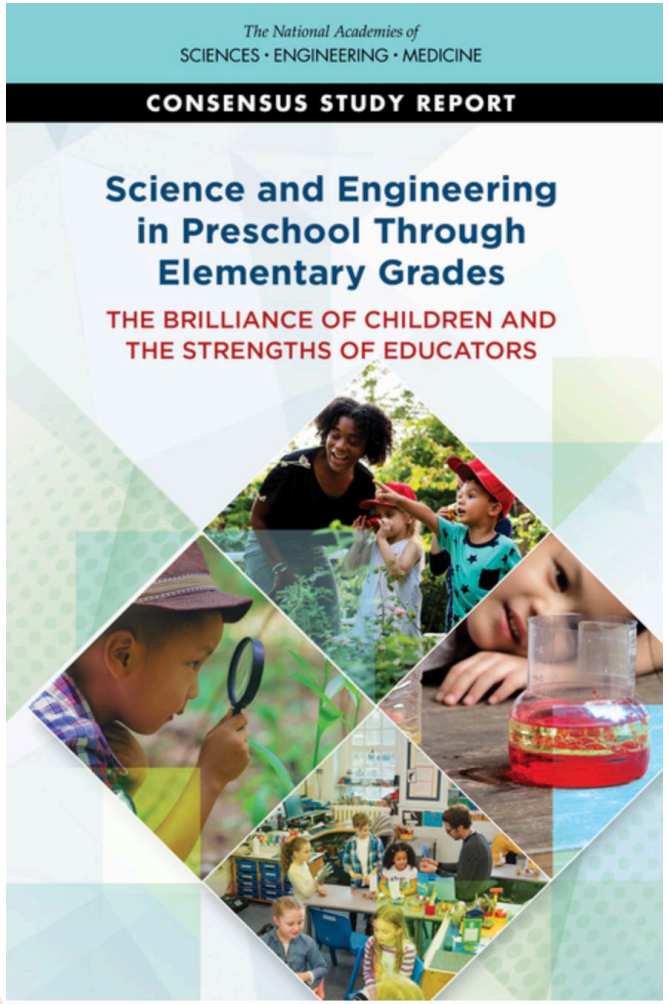
What do you see?



Conclusion 12

"When teachers are able to elicit, notice, value, and build on the many ideas, experiences, and communicative resources that children bring to the classroom, they can organize connections between children's existing knowledge and curiosity and the environment around them, supporting children to continue to make sense of the natural and designed world."

– National Academies of Sciences, Engineering, and Medicine, 2021

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Learning Trajectories Approach

Goal	Developmental Progression	Instruction/Teaching
Where are you hoping to go? The goal is grounded in content knowledge of the topic (science, technology, engineering, or math).	**Where are you now?** Children learn each successive level of thinking in the developmental progression. Children move through the progression via intentional teaching designed to building understanding.	**How do you get there?** Adult practices used to individualize STEM activities within the daily routine and environment. Instructional tasks include the environment (temporal, physical, social), adult-child and peer interactions, and activities or experiences.

Embedding inclusion into learning trajectories

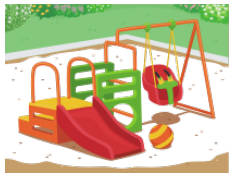
Goal

Developmental Progression

Instructional Tasks:
Adult practices used to individualize STEM activities within the daily routine and environment

STEP 01

Environment, activities, and routines

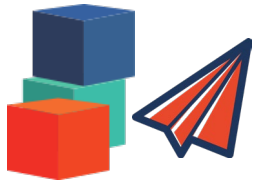


For example, room set-up, equipment, how an activity is done, length of time)

STEP 02

Materials

For example, modifications to toys, materials, AT devices)



STEP 03

Instruction

For example, adding information, reducing steps

Component	Myth	Learning Trajectories
Goal	Narrow behavioral objective	“big ideas”—clusters of concepts & skills(math proficiencies), central and coherent, consistent with children’s thinking, and generative of future learning
Developmental Progression	Sequence of skills in “small steps”	Broad levels of learning; patterns of thinking
Instructional Activities	Either rote-skill based Or Generic	Connected to each level of the developmental progression. Designed to promote thinking at that level–the actions-on-objects (often right in the activity—unitizing, composing, etc.)
Learning Trajectories	Broken down skill sequence all follow in lock step	Building up children from and through their natural ways of thinking

Credit to Drs. Julie Sarama and Doug Clements

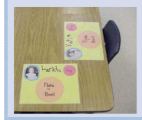
A Guide to Adaptations

1 – Environment

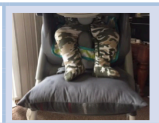
Environmental, activity, and/or routine adaptations are changes and/or accommodations in the setting and/or activity that support inclusive access to learning opportunities, embed interventions, and support full participation and independence for all children.

Area & Space

Arrange the environment and/or materials in a systematic way for a specific purpose

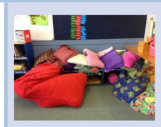


Tape place mats for mealtime routines or use trays for manipulatives, games, and puzzles
Image Credit: CONNECT Module 1, 2009

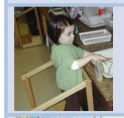


Modified seating (e.g., cube chair, chair with bumpers)
Image Credit: Feeding Littles

Space between centers and tables for wheelchairs and walkers to maneuver
Image Credit: Creative Commons



Limit background noise and distractions
Image Credit: Creative Commons



Add rails to step stools
Image Credit: CONNECT Module 1, 2009

Cover materials not needed for an activity
Image Credit: Creative Commons

Use standing and seating options so that all children are on the same level (e.g., stander at water table, floor-level support seat for group time) *Image Credit: CONNECT Module 1, 2009*

2 – Materials

Materials adaptations are changes and/or accommodations to materials that support inclusive access to learning opportunities, embed interventions, and support full participation and independence for all children.

Grasping Supports

Add additional material(s) to an object to make it easier to grasp, lift, or turn

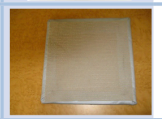
Magnets or Velcro wrist bands to pick up materials
Image Credit: Bridges Activity Module 2021

Cups with handles
Image Credit: Creative Commons

Grip tape and/or tubes to thicken handles
Image Credit: Creative Commons

Deep bowls/plates for easier scooping
Image Credit: Creative Commons

Page fluffers to space apart pages of a book for easier turning
Image Credit: Paths to Literacy, 2018



Stabilizers, like Velcro or rubber shelf liners, for activities, puzzles, and games
Image Credit: Creative Commons

Alternative materials (e.g., soft, squeezable) to support grasping
Image Credit: Creative Commons

Low-tech materials (e.g., Velcro on blocks, tabs, padded handles for toys, tools, and utensils)
Image Credit: Paths to Literacy, 2018

3 – Instruction

Instructional adaptations are changes and/or accommodations to the instruction or teaching that support inclusive access to learning opportunities, embed interventions, and support full participation and independence for all children.

Visual Cues

Use pictures and/or icons to signal next steps

Prompt cards (e.g., pictures of activities and centers)
Image Credit: Creative Commons

First/Then prompts
Image Credit: Creative Commons

Use visuals that clearly illustrate the activity
Image Credit: Creative Commons

Choice boards
Image Credit: Creative Commons

*Use concrete objects to represent schedule (see **Visual Schedules**)*

Add a graphic organizer to aid reading comprehension

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A Guide to Teaching Practices

At STEMIE, we first use adaptations to ensure young children with disabilities can fully participate and engage in STEM (science, technology, engineering, and math) learning opportunities and experiences. However, some young children may require additional instructional supports from adults and/or peers to successfully engage in STEM learning opportunities and experiences.

In this document, we define and describe evidence-based teaching strategies, as well as provide examples of each teaching strategy that adults may use to ensure young children with disabilities can participate fully in STEM learning experiences.

What are teaching strategies?

Teaching strategies are practices used by adults (e.g., family members, practitioners) or, in some instances, by other children to help facilitate children's participation in everyday routines, learning experiences, and activities. Using these strategies engages children in activities, maintains their interest, and provides opportunities for them to learn concepts and thinking skills that support STEM learning when using adaptations (see STEMIE's Adaptations resource for more information) is not a sufficient support.

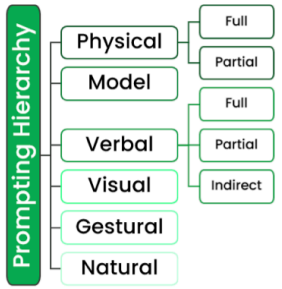
Continuum of Strategies

These teaching practices or strategies can be provided for individual or groups of young children by an adult or sometimes another child such as a sibling or another child in a classroom. Most often, strategies are used purposefully and in addition to adaptations so that children have the individual supports they need to fully engage in STEM learning. But some strategies may also occur naturally.

Prompting

Help given by another person (usually an adult) to assist children in knowing how to do a given behavior or to perform a target behavior in the presence of a target stimulus (Sandall, Hemmeter, Smith, & McLean, 2005). Types of prompts may include verbal, gestural (pointing), and/or physical cues to encourage participation.

- *Visual and verbal prompts to facilitate progression through activities (e.g., a communication choice board paired with the verbal prompt "What's next?)*
- *Use verbal prompts, gestures (e.g., pointing) and sign language in conjunction with spoken language during activities and songs to facilitate engagement (e.g., the adult might pair the sign for "next" with the spoken phrase 'Next, we need the jelly', then point to the jelly)*
- *Use prompt fade (i.e., reduced assistance) as needed to promote children's independence in the activities. For example, an adult might initially offer physical hand-over-hand support for a young child to sign the word "more", fade to prompting with an adult modeling the sign while saying it, and then fade to the adult saying "more?" as an oral prompt for the child to sign "more" independently.*



To reduce prompt dependence and increase child independence, it is recommended to use least-to-most prompting hierarchy. What level of prompting is least intrusive to what prompting level is most intrusive is determined by the child's needs and the setting and/or activity. Often physical prompting is considered the most intrusive level and verbal prompting, or verbal direction, is considered the least intrusive. For example, a natural prompt during water play might be to provide a cup for pouring. A gestural prompt would be to point to the cup and a verbal one would be to say, 'Pour the water'. A visual prompt might look like using a communication board or picture icons to show how to use the cup, while a modeled prompt would involve the adult demonstrating. Full physical support might involve taking the child's hands and showing them how to fill and pour the cup.

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A Guide to Teaching Practices

STEM Opportunities Can Be Incorporated into Everyday Routines and Activities

Think about your favorite STEM Activities!

Everyday STEM Talk: 30 Reframing Ideas for Everyday Moments

Everyday STEM Talk

Instead of just turning on the light, consider holding baby while turning on light and modeling curiosity.

'What is going to happen when I press this?'

Cultivate and encourage your child to think about their learning and to develop their STEM (science, technology, engineering, and math) knowledge by asking open-ended questions, narrating your observations and actions, adding STEM vocabulary to daily routines and activities, and extending activities your child is interested in.

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STEM In Daily Routines

- Getting dressed
- Eating, cooking
- Knowing first-then conditionals
- Ordering items and toys
- Building, stacking, creating
- Problem solving (debugging, redoing, making things happen)
- Trial and error toys and tasks
- Bath time
- Outdoors
- Reading
- Maps

Video examples

Gabe

Goals:

- Gabe will participate independently during mealtime by using utensils to feed himself.

Routines	Planning-What are we doing to address the outcome?	STEM connection
Meal time	• The family will provide tools within reach so that Gabe can independently feed himself	• Sequencing • First-then • The family will narrate: First prunes, then waffles

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Discussion

How is this STEM learning?

- What do you see the child doing?
- What strategies do you see the adult using?

How was the caregiver providing an opportunity for STEM learning in everyday routines and activities?

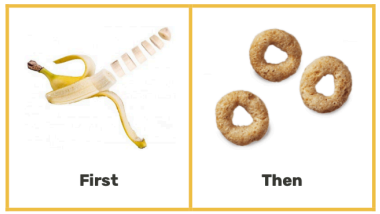
What else do you think the caregiver could do to support the child's STEM learning?

MEALTIME EXPLORATIONS FOR INFANTS (0-12 months)

Mealtimes are a great opportunity to support STEM learning. You can talk about STEM ideas and use STEM words as you feed or talk with your children as they start trying solid foods (right around 6 months).

Children can learn about ***quantity*** ("One more bite!"), ***volume*** ("This cup has more milk."), ***sequencing*** ("First eat the banana, then a Cheerio."), ***physical properties*** ("It is too hot. My ice cream is melting!"), and ***plants*** ("Carrots grow in the ground, but apples grow on trees.")

Children learn new things when they practice them in everyday routines. Try one or two of the following activities during mealtimes. With a little bit of practice, mealtime can become a natural place to talk and learn about STEM. Use these ideas to set up the environment and materials to best suit your children's needs.

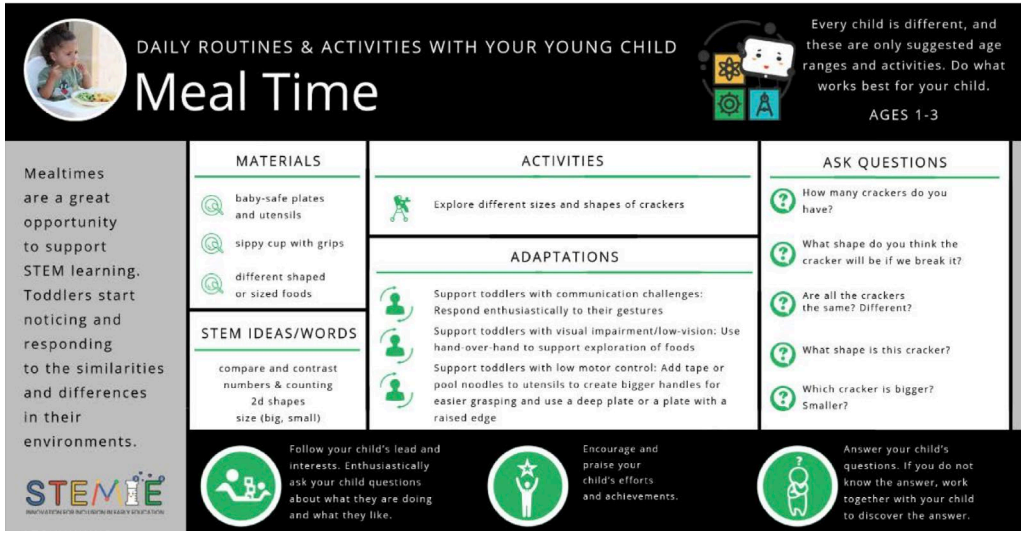


Key STEM Learning:	Science	Computational Thinking	Engineer	Math

Note: STEM concepts are highlighted in **bold** and *italicized*. At the STEMIE center, technology refers to computational thinking.

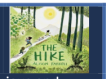
Technology is the introduction of underlying concepts of building or creating technology, including computational thinking, which is the basic logic underlying computer science (U.S. Department of Ed/U.S. Department of Health and Human Services, 2016)

The contents of this resource were developed under a Cooperative Agreement between the U.S. Department of Education, Office of Special Education Programs (OSEP) and the University of North Carolina at Chapel Hill. #H327G180006. These contents do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the Federal Government.



STORYBOOK CONVERSATIONS WITH YOUR YOUNG CHILD

Bookmark with Prompts



The Hike is a book written and illustrated by Alison Farrell.
The Hike is a book about three curious and intrepid young explorers enjoying a hike in the woods. They take notes on what they see, look for tracks, collect leaves and twigs, and even get a little bit lost. How will they find their way back?

Do not forget to PEER! Use additional Prompts if needed, Evaluate and Expand your child's answers, and Repeat the prompts.

If you do not have a paper copy of this book, go to https://www.youtube.com/watch?v=eyrsjFAc1pU to watch a YouTube video of someone reading the book. If you prefer to read it to your child yourself, just mute the audio.

Check your local library to see if it allows you to borrow a digital version of this book to read on a laptop, tablet, or phone. Or find it in a library near you: https://www.worldcat.org/title/hike/oclc/1158903128

Look at STEMIE's tips for making adaptations to the storybook reading process https://stemie.fpg.unc.edu/sites/stemie.fpg.unc.edu/files/Dialogic%20Reading_General%20Adaptations.pdf

If you print this page, you can download or view online by scanning the QR code.

Every child is different, and these are only suggested age ranges and activities. Do what works best for your child.
Print this page and cut around the edges.

Ages 4+ years **Science**

The Hike
By Alison Farrell

Complete a sentence
C **Wren, El, and Hattie go on a _____ (hike).**
Recall
R **How many friends went on the hike? (3)**
Open-ended questions
O **How are the creek, river, and waterfall different? The same?**
WH questions
W **What does the steller jay say? (shook shook)**
Distancing questions
D **What do you like to bring along on a hike? What do you like to collect?**

STEM Words & Ideas to Explore
- Earth Science-Properties (Liquid, Solid)
- Nature Science (Animals, Plants, and the Environment)
- Classify, Sort, Observe, Record

stemie.fpg.unc.edu

https://stemie.fpg.unc.edu/resources?f%5B0%5D=field_routines_everyday_activity%3A58

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INSTRUCTION
The teacher continues to connect the story to the children's experiences.

Discussion

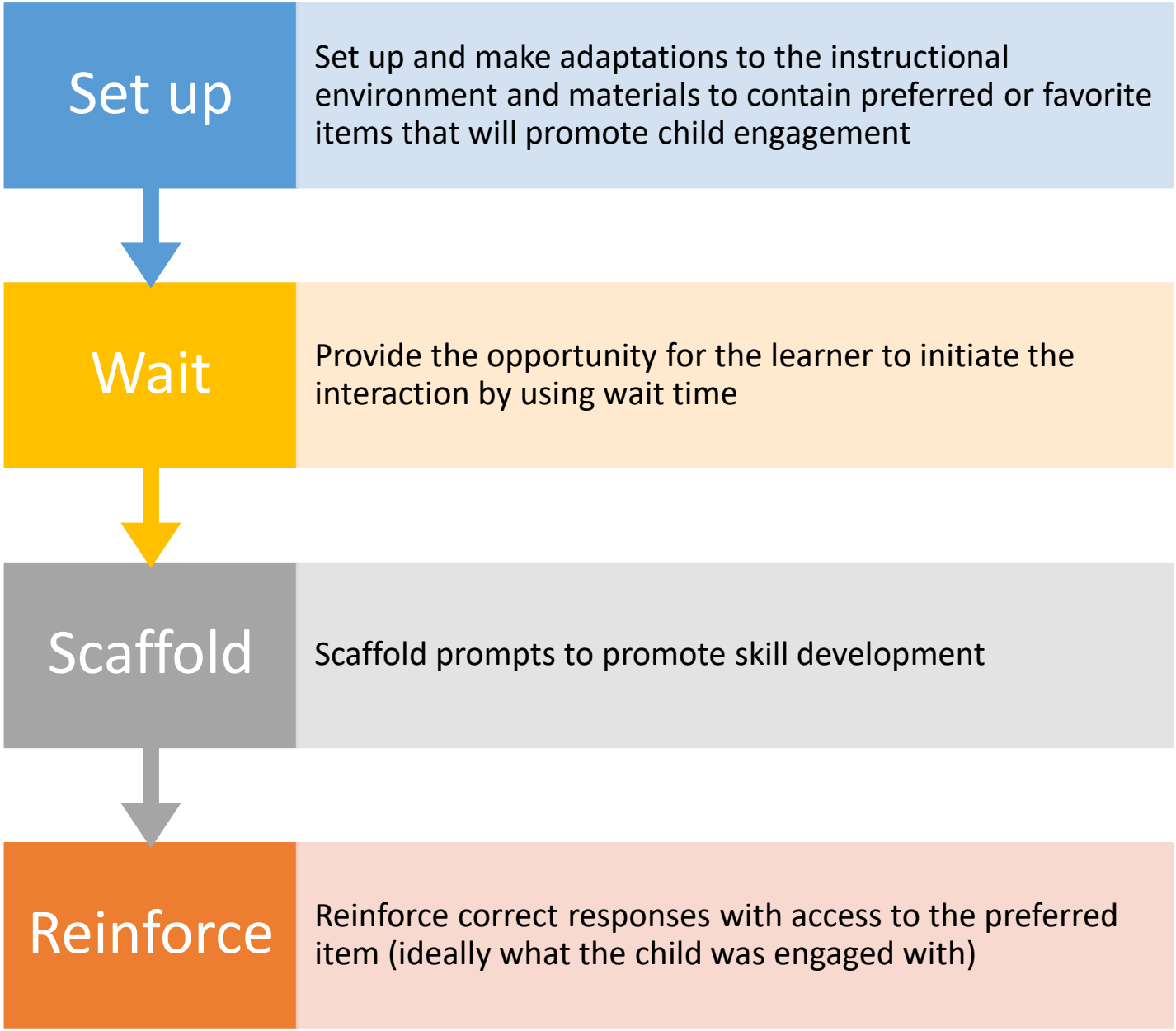
How is this activity STEM learning?

- What do you see the children doing?

- What strategies do you see the adult using?

What else do you think the adult could do to support children's STEM learning?

To do Naturalistic Instruction well we must do the following:



Reflection

In you role, what is one action step you can take NOW to promote inclusive STEM opportunities for young children with disabilities?

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