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Supporting Change and Reform in Preservice Teaching in North Carolina

Go SySTEMic: Integrating STEM Learning Opportunities Across Higher Education Courses and Field Experiences

Jessica Amsbary, Hsiu-Wen Yang, Chih-Ing Lim, Tracey West

UNC FPG CHILD DEVELOPMENT INSTITUTE

IDEAs that Work

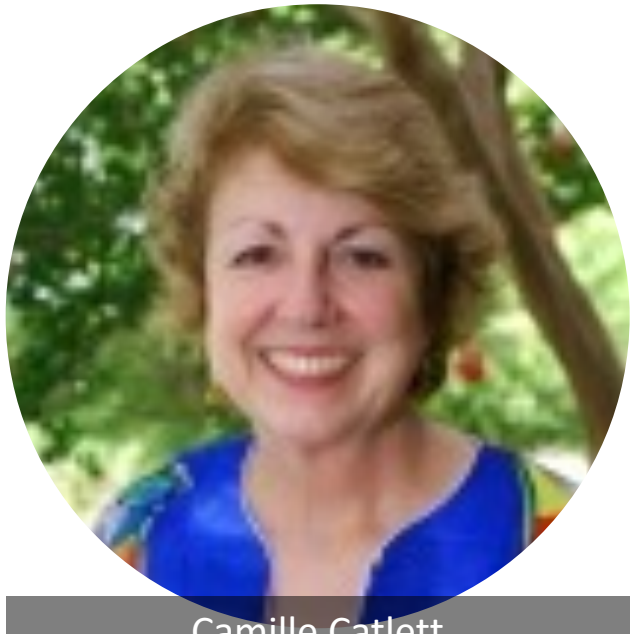
Welcome & Introductions

Meet our guest presenters

Hsiu-wen Yang

Jessica Amsbary

Chih-Ing Lim



Camille Catlett

Tracey West

Meet the Team

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ON

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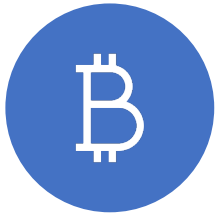
SCRIPT-NC Webinars emphasize…

embedding **inclusion, equity, and diversity** into coursework

opportunities to build both **knowledge acquisition and knowledge application**

content that reflects **evidence-based and recommended practices**



resources that are **readily available and free**

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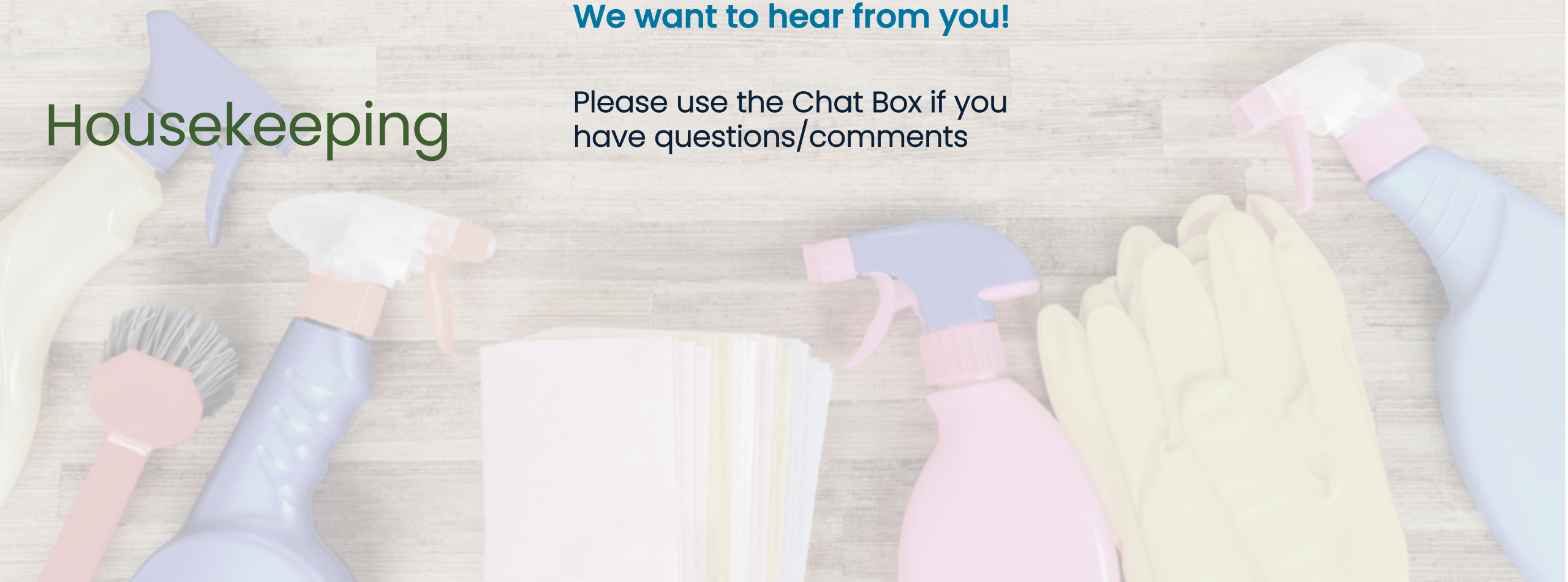
Housekeeping

In order to reduce distractions...
Please mute your microphones.

We want to hear from you!

Please use the Chat Box if you have questions/comments



Find all the materials from today's webinar here

SCAN ME

https://scriptnc.fpg.unc.edu/script-nc-webinar-go-systemic-integrating-stem-learning-opportunities-across-higher-education

More webinar resources

- 2020 SCRIPT-NC webinar on STEM learning
- PowerPoint slides
- Webinar recording

What's a course in which you include an emphasis on STEM?

AGENDA

- Basics and definitions
- Tools & resources
- Embedding STEM learning in any course

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INNOVATION FOR INCLUSION IN EARLY EDUCATION

SCIENCE

Science is the study of structures and processes in the physical and natural world and the process by which knowledge about the physical and natural world is established, extended, refined, and revised (Duschl et al., 2007).

TECHNOLOGY

Technology is the introduction of underlying concepts of building or creating technology, including computational thinking, which is the basic logic underlying computer science (DOE & DHHS, 2016).

ENGINEERING

Engineering is a systematic way of designing solutions to problems. These solutions can be new or improvements on existing solutions.

MATH

Mathematics is the study of patterns in numbers and space, including the concepts, processes, and structures of counting and numbers, space and shapes, and symmetry, as well as a set of mathematical practices by which math knowledge is developed, refined, and applied.

STEM is ...

STEM is an acronym created by the National Science Foundation for science, technology, engineering, and mathematics. In early childhood, STEM can be taught alone or integrated intentionally in groups of two or three, or with the arts, language, literacy, and social emotional learning throughout a child's typical routines and daily activities.

"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

Start 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

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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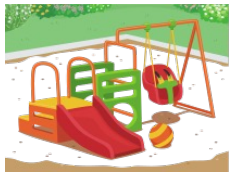
Goal

Developmental Progression

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

STEP 01

Environment, activities, and routines

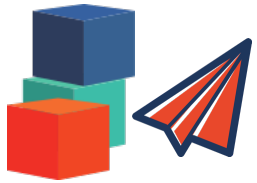


For example, room set-up, equipment, how an activity is done, length of time)

STEP 02

Materials

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



STEP 03

Instruction

For example, adding information, reducing steps

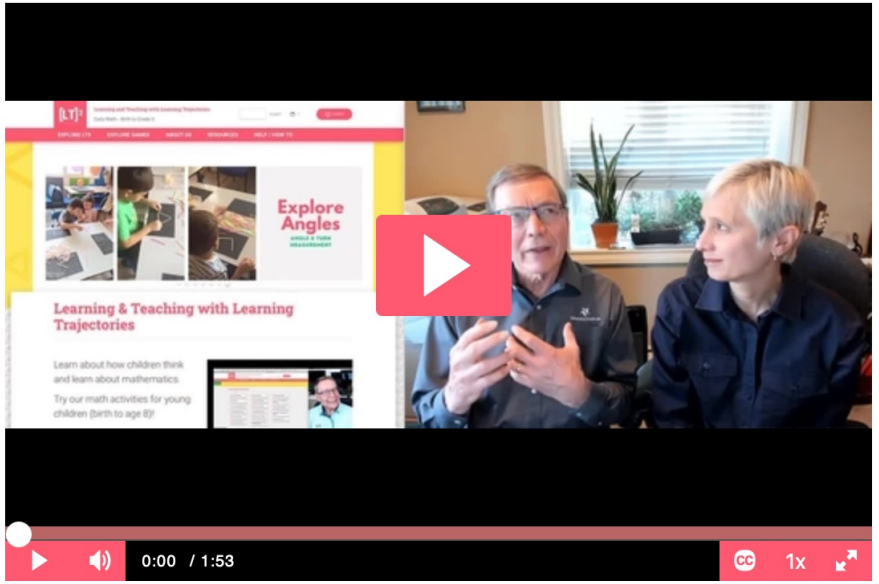
Learning & Teaching with Learning Trajectories

Learn about how children think and learn about mathematics.

Try our math activities for young children (birth to age 8)!

Get started supporting early childhood math learning!

SIGN IN OR SIGN UP



Child Development (see Handout page 3)

- Direct students to review the Guide for Noticing STEM Learning
- Encourage them to design an activity for infants and toddlers
  - Center-Based OR
  - Early Intervention 1:1 session

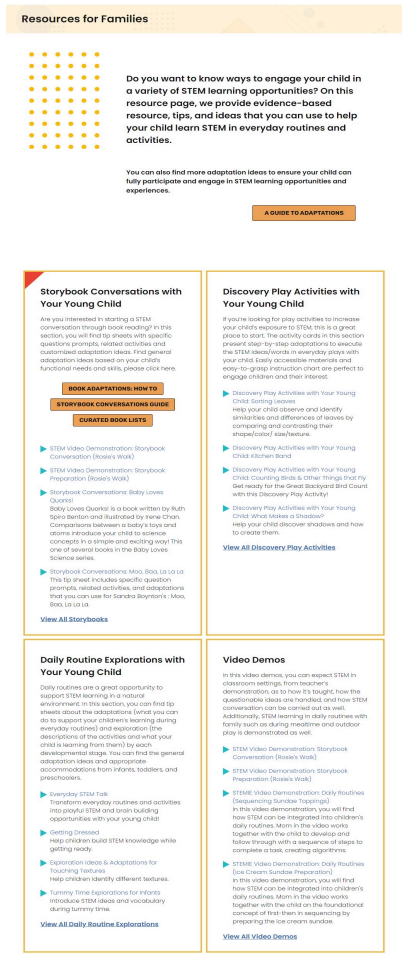
A Guide to *Noticing* STEM Learning

What Do We Mean by Noticing?

Noticing is an important foundational skill for Science, Technology, Engineering, and Math (STEM) learning and across other developmental domains of learning. While, noticing may be interpreted as related to sight only; noticing is used to describe listening, watching, or feeling. In this document, we operationally define noticing and provide examples of different ways young children, including children with disabilities, may show us how they have noticed something/someone in their environment. Operationally defined means that a behavior may be easily, accurately, and reliably observed. For example, two or more people who observe a child picking up a toy with their hand, would be able to agree that the child picked up a toy. However, it might be harder to easily observe behavior that suggests listening, feeling, or watching – words such as noticing might be used to describe a variety of often subtle behavior that might not easily be observed or interpreted. (Bricker et al., 2021)

Family Engagement (see Handout page 6)

- **IDENTIFY STEM LEARNING AND OPPORTUNITIES WITHIN DAILY ROUTINES AND ACTIVITIES**
- Useful resources



Resources for Families

Do you want to know ways to engage your child in a variety of STEM learning opportunities? On this resource page, we provide evidence-based resource, tips, and ideas that you can use to help your child learn STEM in everyday routines and activities.

You can also find more adaptation ideas to ensure your child can fully participate and engage in STEM learning opportunities and experiences.

A GUIDE TO ADAPTATIONS

Storybook Conversations with Your Young Child

Are you interested in starting a STEM conversation through book reading? In this section, you will find tip sheets with specific questions prompts, related activities and customized adaptation ideas. Find general adaptation ideas based on your child's functional needs and skills, please click here.

BOOK ADAPTATIONS: HOW TO
STORYBOOK CONVERSATIONS GUIDE
CURATED BOOK LISTS

- STEM Video Demonstration: Storybook Conversation (Rosie's Walk)
- STEM Video Demonstration: Storybook Preparation (Rosie's Walk)
- Storybook Conversations: Baby Loves Quarks!
  Baby Loves Quarks! is a book written by Ruth Spiro Benton and illustrated by Irene Chan. Comparisons between a baby's toys and atoms introduce your child to science concepts in a simple and exciting way! This one of several books in the Baby Loves Science series.
- Storybook Conversations: Moo, Baa, La La La
  This tip sheet includes specific question prompts, related activities, and adaptations that you can use for Sandra Boynton's : Moo, Baa, La La La.

View All Storybooks

Discovery Play Activities with Your Young Child

If you're looking for play activities to increase your child's exposure to STEM, this is a great place to start. The activity cards in this section present step-by-step adaptations to execute the STEM ideas/words in everyday plays with your child. Easily accessible materials and easy-to-grasp instruction chart are perfect to engage children and their interest.

- Discovery Play Activities with Your Young Child: Sorting Leaves
  Help your child observe and identify similarities and differences of leaves by comparing and contrasting their shape/color/ size/texture.
- Discovery Play Activities with Your Young Child: Kitchen Band
- Discovery Play Activities with Your Young Child: Counting Birds & Other Things that Fly
  Get ready for the Great Backyard Bird Count with this Discovery Play Activity!
- Discovery Play Activities with Your Young Child: What Makes a Shadow?
  Help your child discover shadows and how to create them.

View All Discovery Play Activities

Daily Routine Explorations with Your Young Child

Daily routines are a great opportunity to support STEM learning in a natural environment. In this section, you can find tip sheets about the adaptations (what you can do to support your children's learning during everyday routines) and exploration (the descriptions of the activities and what your child is learning from them) by each developmental stage. You can find the general adaptation ideas and appropriate accommodations from infants, toddlers, and preschoolers.

- Everyday STEM Talk
  Transform everyday routines and activities into playful STEM and brain building opportunities with your young child!
- Getting Dressed
  Help children build STEM knowledge while getting ready.
- Exploration Ideas & Adaptations for Touching Textures
  Help children identify different textures.
- Tummy Time Explorations for Infants
  Introduce STEM ideas and vocabulary during tummy time.

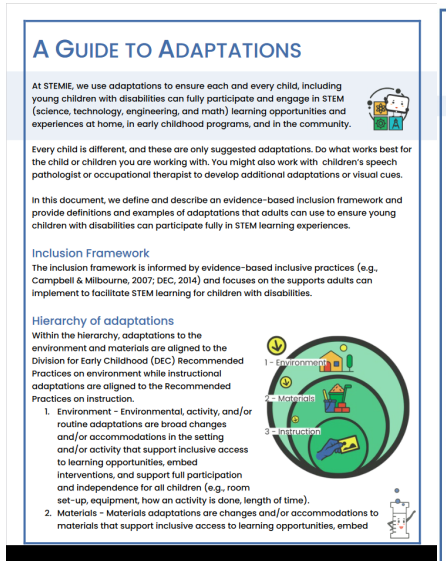
View All Daily Routine Explorations

Video Demos

In this video demos, you can expect STEM in classroom settings, from teacher's demonstration, as to how it's taught, how the questionable ideas are handled, and how STEM conversation can be carried out as well. Additionally, STEM learning in daily routines with family such as during mealtime and outdoor play is demonstrated as well.

- STEM Video Demonstration: Storybook Conversation (Rosie's Walk)
- STEM Video Demonstration: Storybook Preparation (Rosie's Walk)
- STEMIE Video Demonstration: Daily Routines (Sequencing Sundae Toppings)
  In this video demonstration, you will find how STEM can be integrated into children's daily routines. Mom in the video works together with the child to develop and follow through with a sequence of steps to complete a task, creating algorithms.
- STEMIE Video Demonstration: Daily Routines (Ice Cream Sundae Preparation)
  In this video demonstration, you will find how STEM can be integrated into children's daily routines. Mom in the video works together with the child on the foundational concept of first-then in sequencing by preparing the ice cream sundae.

View All Video Demos



A GUIDE TO ADAPTATIONS

At STEMIE, we use adaptations to ensure each and every child, including young children with disabilities can fully participate and engage in STEM (science, technology, engineering, and math) learning opportunities and experiences at home, in early childhood programs, and in the community.

Every child is different, and these are only suggested adaptations. Do what works best for the child or children you are working with. You might also work with children's speech pathologist or occupational therapist to develop additional adaptations or visual cues.

In this document, we define and describe an evidence-based inclusion framework and provide definitions and examples of adaptations that adults can use to ensure young children with disabilities can participate fully in STEM learning experiences.

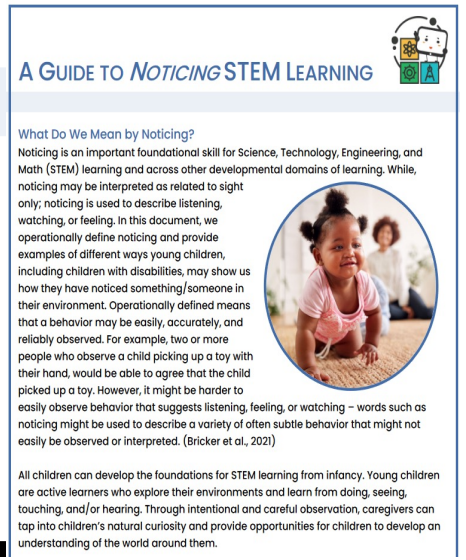
Inclusion Framework

The inclusion framework is informed by evidence-based inclusive practices (e.g., Campbell & Milbourne, 2007; DEC, 2014) and focuses on the supports adults can implement to facilitate STEM learning for children with disabilities.

Hierarchy of adaptations

Within the hierarchy, adaptations to the environment and materials are aligned to the Division for Early Childhood (DEC) Recommended Practices on environment while instructional adaptations are aligned to the Recommended Practices on instruction.

1. Environment - Environmental, activity, and/or routine adaptations are broad 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 (e.g., room set-up, equipment, how an activity is done, length of time).
2. Materials - Materials adaptations are changes and/or accommodations to materials that support inclusive access to learning opportunities, embed

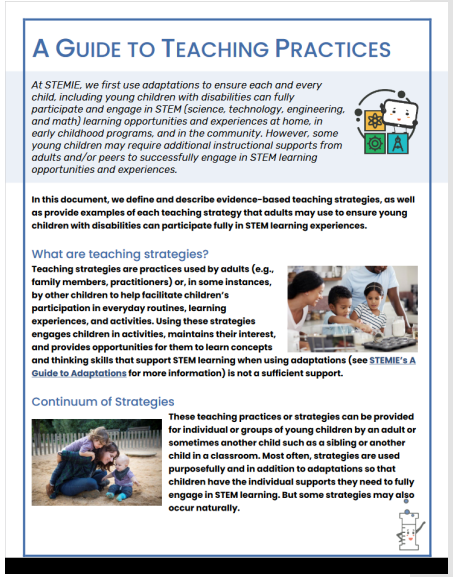


A GUIDE TO *NOTICING* STEM LEARNING

What Do We Mean by Noticing?

Noticing is an important foundational skill for Science, Technology, Engineering, and Math (STEM) learning and across other developmental domains of learning. While, noticing may be interpreted as related to sight only; noticing is used to describe listening, watching, or feeling. In this document, we operationally define noticing and provide examples of different ways young children, including children with disabilities, may show us how they have noticed something/someone in their environment. Operationally defined means that a behavior may be easily, accurately, and reliably observed. For example, two or more people who observe a child picking up a toy with their hand, would be able to agree that the child picked up a toy. However, it might be harder to easily observe behavior that suggests listening, feeling, or watching – words such as noticing might be used to describe a variety of often subtle behavior that might not easily be observed or interpreted. (Bricker et al., 2021)

All children can develop the foundations for STEM learning from infancy. Young children are active learners who explore their environments and learn from doing, seeing, touching, and/or hearing. Through intentional and careful observation, caregivers can tap into children's natural curiosity and provide opportunities for children to develop an understanding of the world around them.



A GUIDE TO TEACHING PRACTICES

At STEMIE, we first use adaptations to ensure each and every child, including young children with disabilities can fully participate and engage in STEM (science, technology, engineering, and math) learning opportunities and experiences at home, in early childhood programs, and in the community. 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 A Guide to Adaptations 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.

Why Families are Critical in Cultivating STEM learning

Families have the power to affirm children's identities (i.e., in STEM, racial/ethnic)

Making learning fun for young children and engaging their interest is positively associated with better academic skills

Embedding STEM learning opportunities within everyday routines and activities can bring about positive outcomes for young children with and without disabilities

See Page 6

- Watch the video and discuss

What STEM Concept Is The Child Learning?
What Do You See The Child Doing?
What Strategies Do You See The Mom Using?
How Was The Mom Providing An Opportunity For STEM Learning?

Additional assignment

Ms. Rondell's preschool class has been engaged in exploring force and motion with ramps and a variety of objects including balls and blocks. Some vocabulary that has been introduced included words related to speed (e.g., fast, slow), or attributes of objects (heavy, light, round, flat), and action (e.g., push, pull) and the level of force (e.g., hard, gentle). Ms. Rondell would like to provide 3 different ideas, each with 1-2 examples of open-ended questions that families could try at home or in the community with their children.

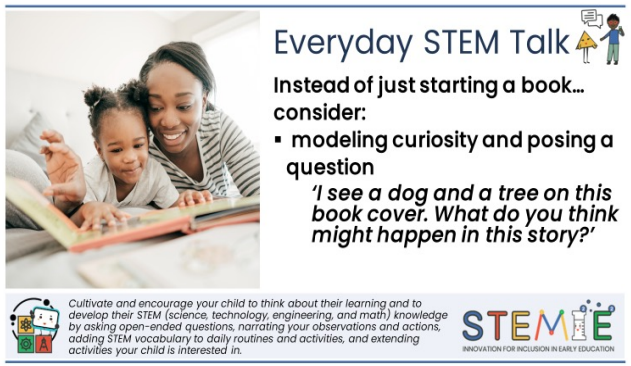
See Page 7

- Watch the video and discuss

What Are The Child's Interests?
How Do You Know That?
What Are Some Potential STEM Learning Opportunities?

Language and Literacy (see Handout page 10)

- **EVERYDAY STEM TALK**
- Useful resources



Everyday STEM Talk

Instead of just starting a book… consider:

- **modeling curiosity and posing a question**
  - ***'I see a dog and a tree on this book cover. What do you think might happen in this story?'***

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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A Guide to *Noticing* STEM Learning

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A Guide to Asking Open-Ended Questions

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.

Open-ended questions are questions that require more than a simple 'yes' or 'no' response. By asking open-ended questions that start with 'Why,' 'How,' or 'What,' children are encouraged to describe and extend their thinking, increase their language development, give meaning to their experiences, and develop STEM knowledge and skills.

Interacting with children in sensitive and responsive ways is foundational to fostering all children's learning (DEC, 2014). Using open-ended questions can be a powerful way to foster positive interactions between you and your child. Asking open-ended questions lets you join in and expand on your child's interests, focus, and intent as they explore, play, and interact with others throughout the day (DEC RP INT4). Asking open-ended questions also helps scaffold your child's learning and promotes your child's problem-solving behavior (DEC RP INT5).

Some Tips

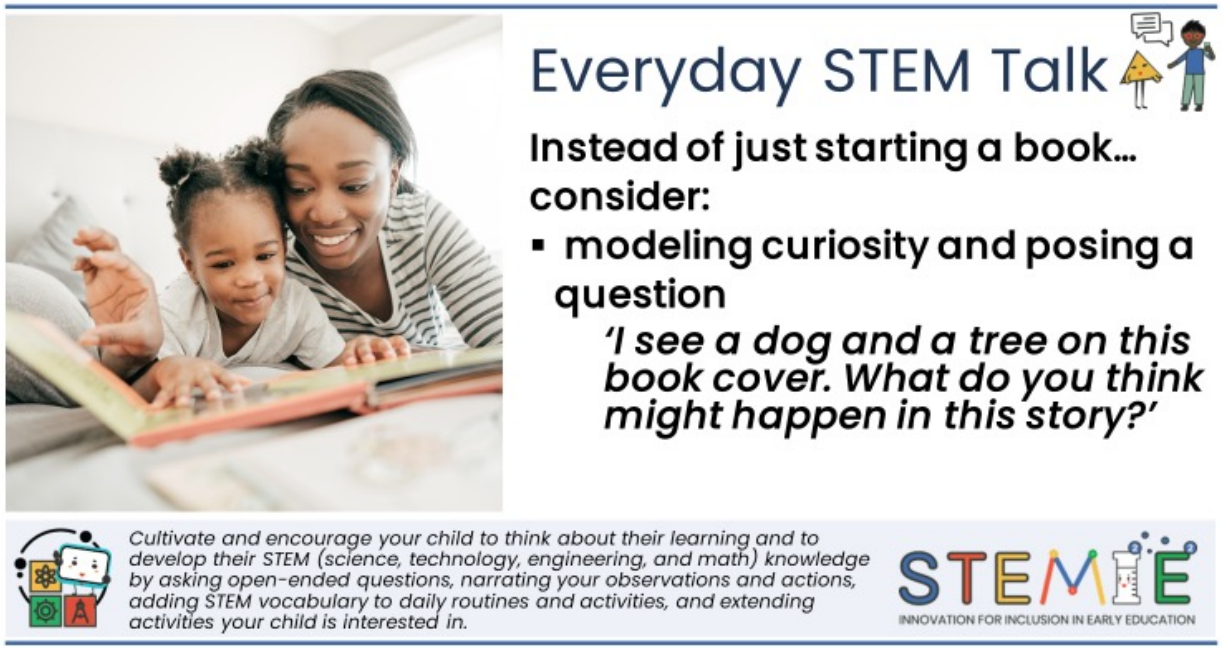
- **Always follow your child's lead and interests**
- **If you get a 'yes' or 'no' for a response or no response at all, try rewording the question another way, or simplifying the question**
- **You may also need to model how to answer an open-ended question for children who may be new to it**
- **If you get a surprising or unique response, expand upon the response, and ask, "Tell me more about…"**
- **Remember to provide at least three seconds for your child to respond**
- **Encourage your child to ask their own questions and test their answers**
- **Follow us on Twitter (@STEMIIEE) for daily STEM prompts**

Everyday STEM Talk

Review the Everyday STEM talk document and use the examples to describe how STEM talk could look like within everyday routines and activities

After reviewing the examples, ask students to provide additional prompts, questions or STEM talk for the following scenarios:

- While getting ready for bed
- While at the grocery store
- While going for a walk
- Changing diapers
- At mealtime

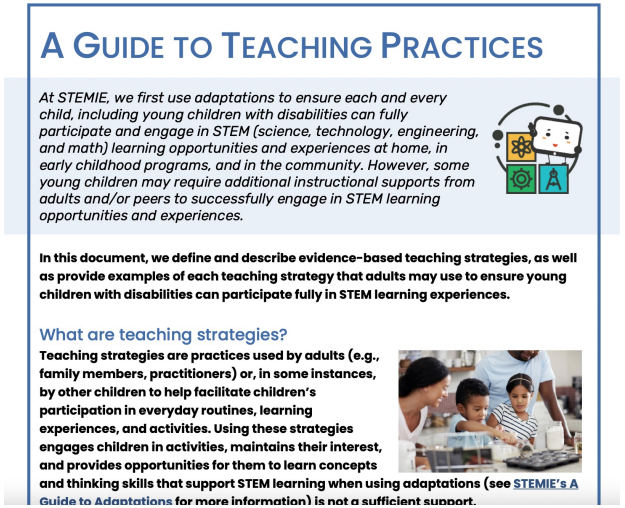


Health, Safety and Nutrition (see Handout page 15)

- Opportunities for lesson planning around healthy eating how and why
- Computational Thinking Snack Making (Algorithms):
  - Students can design a way for their students to determine steps for making a healthy snack
    - Nut butter and raisins on celery
    - Simple sandwiches
    - Simple sequences with different snack items (goldfish, cheese, goldfish, cheese, etc.)

Practicum (see Handout page 16)

- Have students review A Guide to Teaching and a Guide to Adaptations.
- Develop teaching lesson/unit beginning with an anticipatory web based on a STEM topic
- Carry out teaching activity in their practicum setting OR for their classmates during a synchronous session.



A Guide to Teaching Practices

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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.

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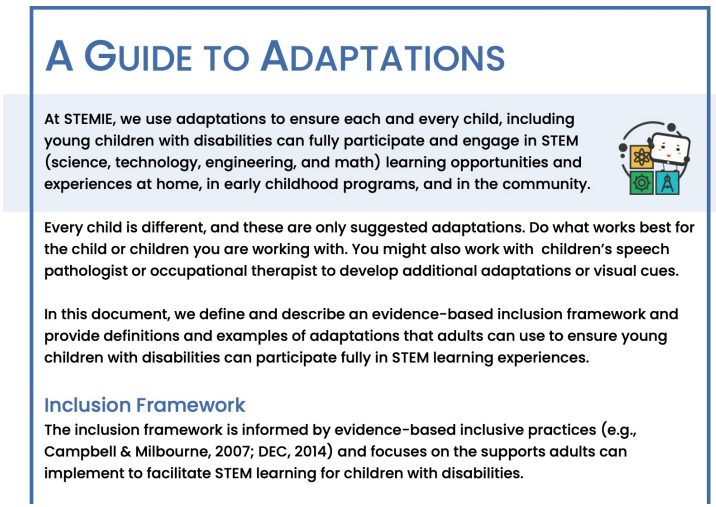

A Guide to Adaptations

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In this document, we define and describe an evidence-based inclusion framework and provide definitions and examples of adaptations that adults can use to ensure young children with disabilities can participate fully in STEM learning experiences.

Inclusion Framework

The inclusion framework is informed by evidence-based inclusive practices (e.g., Campbell & Milbourne, 2007; DEC, 2014) and focuses on the supports adults can implement to facilitate STEM learning for children with disabilities.

Bonus: Example of course focused on STEM learning

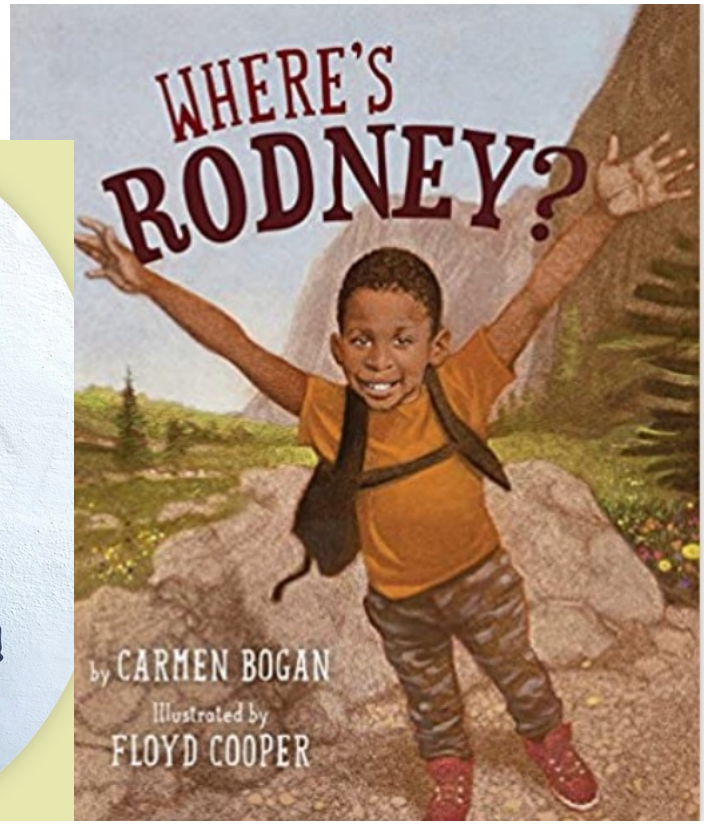
- Educational Workshop: Early STEM and Inclusion
  - STEM Storybook Review
  - STEM Multi-media Posts
  - Integrative STEM Teaching Projects
  - Elevator Speech on Importance of STEM Learning

SCAN ME

https://unc.zoom.us/webinar/register/WN_ocBbgMCWRVKrRTg4O9TK-A

Opening and Closing Keynote

Dr. Renee Horton, NASA Space Launch System (SLS) Quality Engineer



Carmen Bogan, author of "Where's Rodney?"

Free monthly newsletter.

Sign up at https://stemie.fpg.unc.edu/stay-connected

SCAN ME

STEMIE

INNOVATION FOR INCLUSION IN EARLY EDUCATION

Inclusion for all in STEM learning!

Cultivating STEM learning opportunities for all young children throughout their daily routines and activities in any environment.

Winter Wonderland!

Whether you are snowed in or are bundling up to go outside, STEMIE has activities and ideas that can tap into children's natural sense of wonder and help support you in cultivating STEM learning opportunities.

Cozying up indoors? Check out suggested prompts, extension activities, and adaptations for Ezra Keats' book, *The Snowy Day*.

The Snowy Day

Braving the cold? Consider some tips and adaptation ideas for a nature scavenger hunt.

Scavenger Hunt

Find more storybook conversation ideas and STEM learning within daily routines and activities.

Family Resources

Coming Soon!

STEM domains, the big ideas and progressions within those big ideas, and activities and resources specific to the progressions.

What is one thing you will do as a result of what you heard or saw in this webinar?

SCRIPT-NC Website

https://scriptnc.fpg.unc.edu

Give Us Your Feedback

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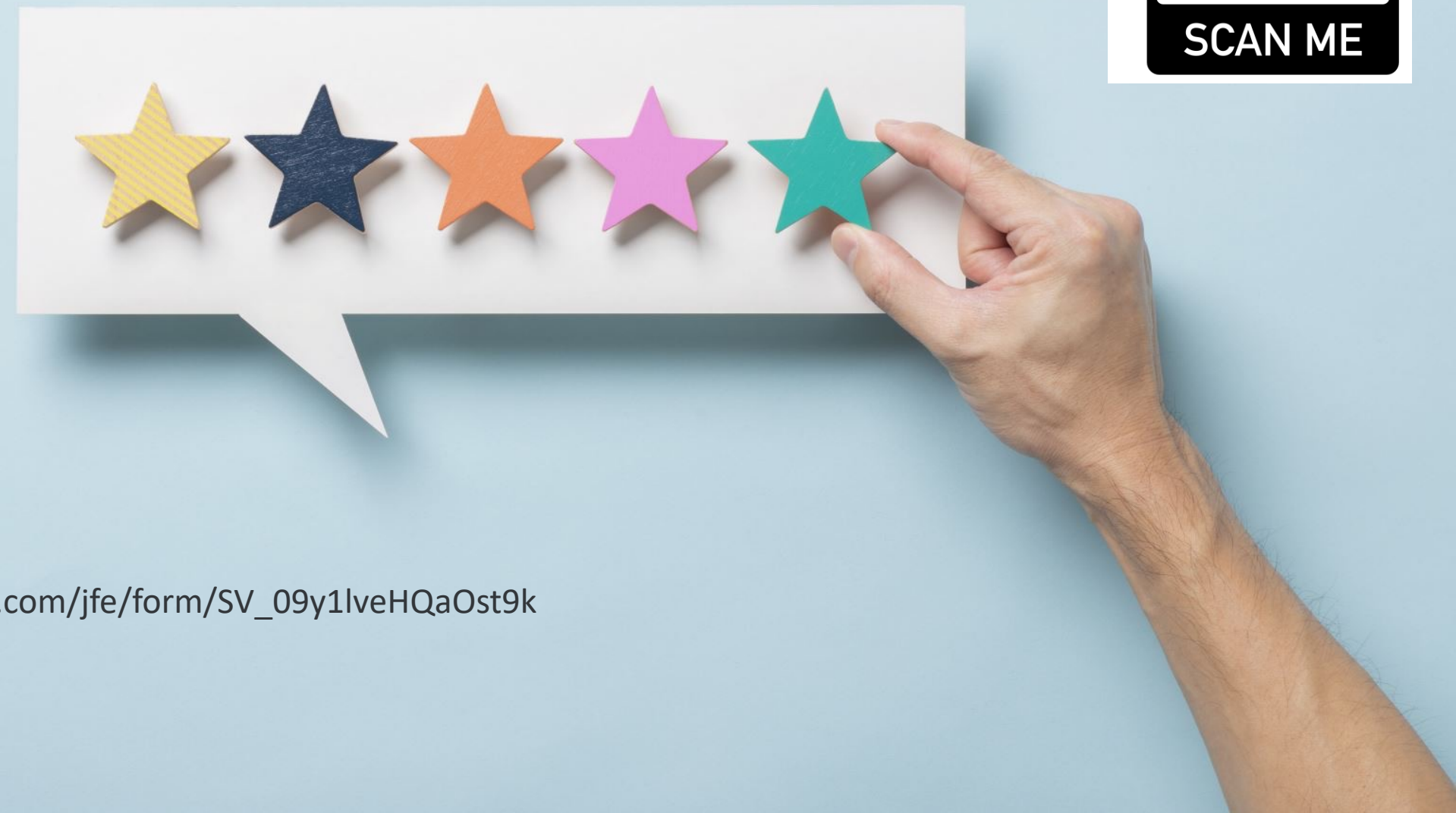

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