A Guide to Addressing STEM Myths

In this document, we explore current issues affecting STEM learning experiences and opportunities for young children, including children with disabilities. We describe what needs to be cultivated to address these issues, so that all young children have equitable and inclusive access to STEM learning experiences and opportunities.

Issues Affecting STEM Learning

There are many prevailing beliefs and attitudes about child development, disability, learning, and STEM that limit STEM learning opportunities for young children, including children with disabilities. Select any myth below to learn the facts and what you can do support STEM learning for all young children.

MYTH: "Children with disabilities can't do STEM."

FACT: ALL children, regardless of disability, culture, race/ethnicity, gender, age, and/or socioeconomic status, have the capacity to engage in STEM learning experiences.

All children, regardless of disability, culture, race/ethnicity, gender, age, and/or socioeconomic status, have the capacity to engage in STEM learning experiences. With intentional and cultivated support from adults (e.g., practitioners, families), children with disabilities have many STEM learning opportunities in their home, school and/or community settings.

Source: STEM4EC Blog – Mythbuster Series #1[3]

What Can I Do?

- Follow the child's lead and support their learning based on their interests and strengths.
- Visit STEM Innovation for Inclusion in Early Education (STEMIE) for professional development[29-33], guides[48-57], and STEM activity ideas[90-119] for young children.
- Consider adapting the environment, materials, and instruction to ensure each and every child can participate and fully engage in STEM learning opportunities. For more information, please see A Guide to Adaptations[55] and A Guide to Teaching Practices[56].
- See STEM Starts Now video to learn more about why STEM is important for children with disabilities.[34]
- Watch Unfolding Understanding of Force and Motion video to learn more how to support young children with and without disabilities using instructional practices and learning trajectories.[44]
- See STEMIE's curated list of books about Disability in STEM[87] and Innovators[83, 85-86, 88] from different cultural groups.

MYTH: "You can always tell who has a disability."

FACT: Not all disabilities are visible.

Some disabilities that encompass physical, language, cognitive, and/or neurological impairment may not easily recognizable, and are often referred to as *invisible* disabilities. Developmental language disorders, autism, deaf/hearing impairment, blind/low vision, and attention-deficit disorders are some examples of an invisible disability. By learning about and building on children's strengths and interests, adults (e.g., practitioners, families) can engage in responsive interactions and provide the necessary adaptations to support each and every child to fully engage in equitable learning opportunities.

Source: Reimagining Special Education for Those With Invisible Disabilities[168]

What Can I Do?

- Reflect on your own beliefs and biases about children with disabilities.[52] Consider how children with "invisible" disabilities and/or behaviors that interfere with their learning may benefit from adaptations and/or additional supports and teaching practices to participate in STEM learning.
- Use dialogic reading during Storybook Conversations focused on various STEM topics to support critical thinking and learning for young children with disabilities.[59-82]
- Use A Guide to Adaptations[55] and A Guide to Teaching Practices[56] to ensure young children with disabilities can fully participate and engage in STEM learning opportunities and experiences.
- Learn more about how to embed foundational STEM concepts and learning opportunities into daily routines and activities with STEMIE PD Series: Adaptations to Everyday Routines and Activities: Make STEM Happen for Infants and Toddlers.[29]
- See STEMIE and Kansas Deaf-Blind Project demonstration videos to learn more about how to adapt storybook reading for children with vision impairments.[45-46]

MYTH: "Children with disabilities will never have a productive and successful life. They will always need help."

FACT: ALL young children are capable of learning and achieving success, and they learn best when adults in their lives hold them to high expectations.

All young children are capable of learning, and they learn best when adults in their lives hold them to high expectations. Research has shown that when adults hold high expectations and include young children with disabilities in learning opportunities alongside with their peers, children can reach their full potential and participate fully in learning.

Source: STEM4EC Blog – Mythbuster Series #1[3]

What Can I Do?

- See STEMIE's Why Inclusion video series to learn more about why inclusion is important and the benefits of inclusion for young children with and without disabilities.[38-40]
- See STEMIE's STEM Starts Now video to learn more about why STEM is important for children with disabilities.[34]
- Reflect on your own beliefs and biases about children with disabilities.[52]

MYTH: "Children are like sponges or are set to auto-pilot when it comes to learning."

FACT: Children learn in the context of supportive communities, through positive interactions with peers and adults.

The myth that all children automatically absorb new information like a sponge has origins in scientists' observations of typically developing children's language development. However, research has demonstrated that individual (e.g., the presence of a learning difference or disability) and social and cultural factors (e.g., opportunities for exposure to the learning content) are critical in influencing learning, more so than passively watching television. Responsive interactions that include observing, interpreting, and responding contingently can support each and every child's language, cognitive, STEM, and emotional competence. Additionally, some children may benefit from more targeted instruction in the domain of their disability (such as phonemic awareness for children at risk for dyslexia, vocabulary for children with developmental language disorders, or social skills for children with autism). However, guided instructional approaches can still be playful and embedded within meaningful routines and activities.

Sources:

- Turn Off TV to Teach Toddlers New Words[157]
- Direct Instruction, DISTAR, and Language for Learning[147]
- Recommended Practices Module 1: Interaction[155]

What Can I Do?

- Consider the hierarchy of adaptations from A Guide to Adaptations that children with disabilities may need to access STEM learning.[55] Also see A Guide to Teaching Practices as additional supports for accessing STEM learning.[56]
- Learn more about using teacher-guided play in STEM learning with our STEM4EC Blog – Mythbuster Series #4.[1]
- Learn how to observe, interpret. and respond contingently to support children's learning and development in language, cognitive and social-emotional competence.[151]

MYTH: "Children only succeed because they are motivated. Socioeconomic status, race/ethnicity, and/or ability-level does not factor into success."

FACT: While all children are motivated to learn, children who are from underserved communities and/or with disabilities are often denied opportunities to reach their full potential.

From infancy, children have a sense of wonder and curiosity about the world around them and are eager to learn. However young children who are from underserved communities and/or with disabilities are often denied of opportunities to reach their full potential. Children depend on adults in their lives to provide them with equitable and positive learning experiences and opportunities. It is important to note that adults too need equitable supports and resources (e.g., worthy wages, professional development) to provide children with positive and responsive learning environment and interactions that can help children be successful.

Sources:

- STEM for Inclusive Excellence and Equity[135]
- Advancing Equity in Early Childhood Education[143]

What Can I Do?

- Start by reflecting on personal biases and beliefs about culture, ability, and race, and recognize systems of bias that continue to deny some children equitable learning opportunities.[52]
- Learn more about how you can do your part in Advancing Equity in Early Childhood Education.[143]
- Learn more about motivation and how you can help support and encourage children's intrinsic motivation to learn.[144]
- Read about and watch Alex's story to learn more about why it is important to provide equitable learning opportunities in STEM.[14, 35]

MYTH: "Children don't learn at childcare."

FACT: High-quality childcare and early childhood education has been found to facilitate children's mathematical and science learning.

Children in high-quality early childhood education settings may have opportunities to explore cause and effect through dropping a ball down the slide, or measurement through trying on different sized shoes in the pretend play area. Some discovery learning occurs naturally through children's curiosity and active exploration, but with the assistance of a skilled teacher those explorations can be expanded on to teach foundational STEM concepts.

Source: Engaging Preschoolers in STEM: It's Easier Than You Think![150]

What Can I Do?

- Watch STEMIE PD Series: Adaptations to Everyday Routines and Activities: Make STEM Happen for Infants and Toddlers for adaptations to everyday routines and activities and consider how childcare settings might implement these.[29]
- Explore teaching strategies for STEM learning for all in action at several high-quality childcare programs with Peep and the Big Wide World's Teaching Strategies Video Library.[154] Peep is also available in accessible format.
- Join the STEM4EC professional learning community to connect, hear from, and collaborate with colleagues and researchers in early childhood education![132]
- See STEMIE's Why Inclusion video series to learn more about why inclusion is important and the benefits of inclusion for young children with and without disabilities.[38-40]

MYTH: "Only formal education, such as in a school classroom, is a real education."

FACT: Meaningful learning can happen outside the classroom setting, such as at home and in the community (e.g., museums, grocery store, outdoors).

Many learning opportunities happen outside the regular classroom setting. Through adult-child discussions and positive interactions, children can learn and understand "real world" problem-solving and experiences that go beyond the classroom environment. These learning opportunities are a crucial aspect of STEM learning and education. For example, adults can guide children to observe and feel rocks of varied sizes, colors, and/or textures, and ask questions or encourage children to form questions based on their observation while taking a walk. Many museums and libraries also have activities on site or are available virtually that families could experience alongside with their children. With appropriate environmental modifications and adaptations to activities, materials, or instruction, children with and without disabilities can access and participate fully in a variety of informal learning opportunities outside of the classroom.

Sources:

- Leveraging Research on Informal Learning to Inform Policy on Promoting Early STEM[138]
- STEAM the Child's Way with Boston Children's Museum[31]

What Can I Do?

- Help children learn and understand real-world problem-solving and experiences by asking questions and encouraging children to think critically. For example, *'What did you notice about?' 'I wonder why…?* For more examples of open-ended questions, see A Guide to Asking Open-Ended Questions.[53]
- Learn more about supporting STEM learning at home with STEM4EC Blog - Enhance STEM Learning and Participation for Young Children with Disabilities.[7]
- Learn more about supporting STEM learning outside the classroom setting with STEMIE's Discovery Play Activities with Your Young Child series.[90-110]

MYTH: "Play is not learning."

FACT: Children learn through play.

Children learn through play and in fact, play is critical and supports children's joyful, 'hands-on' exploration and learning across all domains of development (e.g., cognitive, social-emotional, physical, executive function, language and literacy, and STEM). Children who are underserved are often denied the opportunity to play, and are offered teacher-directed didactic instruction instead, which can lead to negative outcomes. Play can come in different forms (e.g., self-directed, parallel play, cooperative play) and it is important for adults to intentionally set up the learning environment and materials that are based on children's interest. It is also important for adults to provide children with time to play, while providing appropriate instruction when needed (e.g., scaffolding, asking questions or making comments) to support children in child-led playful learning experiences.

Source: NAEYC's Developmentally Appropriate Practice: Principle 3[143]

What Can I Do?

- Learn more about what is play, why learning through play is critical, and how to support children's play.[146]
- Learn more about adult guided play in STEM learning with our STEM4EC Blog – Mythbuster Series #4.[1]
- Engage in play with children by asking questions and encouraging children to think critically by Asking Open-Ended Questions.[53]
- Learn more about Developmentally Appropriate Practice, like guided play (see pages 9-10).[143]

MYTH: "Children should only learn through free play."

FACT: Research suggests that adult-guided play (e.g., scaffolding, intentional teaching) is effective for improving children's academic achievement and quality of young children's play.

Research suggests that adult-guided play (e.g., scaffolding, intentional teaching) has been proven successful in improving children's academic achievement and quality of young children's play. Guided play does not mean that adults are providing direct, didactic instruction nor does it mean that children are not provided opportunities for self-directed play. Instead, guided play means that adults are intentionally setting up the learning environment and materials that are based on children's interest, and providing appropriate instruction when needed (e.g., scaffolding, asking questions or making comments) to support children engage in child-led playful learning experiences.

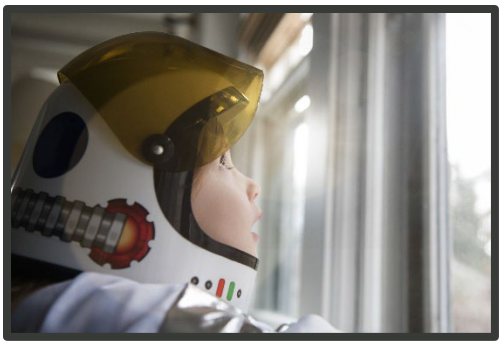
Source: STEM4EC Blog – Mythbuster Series #4[1]

What Can I Do?

- Follow child's lead by supporting their play and learning choices based on their interests and strengths and scaffolding their learning experiences. See A Guide to Teaching Practices for more information about scaffolding.[56]
- Engage in play with children by asking questions and encouraging children to think critically. For example, *'What are you making?' 'I wonder what would happen if…?'* For more examples of open-ended questions see A Guide to Asking Open-Ended Questions.[53]
- Learn more about Developmentally Appropriate Practice, including guided play (see pages 9-10).[143]
- See the STEM is Everywhere! Making STEM Happen for All Young Children video to learn how cultivate guided play anywhere.[37]

MYTH: "Children only need to learn to read and write."

FACT: STEM learning benefits children's executive functioning, which is an important predictor of children's success in reading and writing.



STEM learning competencies, like mathematical reasoning, number skills, problem-solving skills and persistence, are important predictors of children's school success. These competencies are also linked to executive function, which is a cognitive set of abilities that includes flexible thinking, working memory, and ability to inhibit incorrect or inappropriate responses. Executive function predicts children's school success as well, which means STEM skills influence learning directly and indirectly (through executive function). Finally, reading and writing skills are supported by the same language skills that support STEM! Positional and time-oriented words like *more*, *less*, *bigger*, *smaller*, *next*, and *later* are essential to reading comprehension. STEM competencies influence everything children learn!

Sources:

- NCSL's Early STEM Education153
- Early STEM Matters: Providing High-Quality STEM Experiences for All Young Learners[137]

What Can I Do?

- Explore STEM4EC Blog - What Predicts Success in STEM… and School? and consider how to integrate STEM competencies across the curriculum.[9]
- Check out Storybook Conversations for tips on integrating STEM vocabulary and concepts into dialogic reading, a research-proven strategy for supporting early language.[58-89]
- Learn more about STEM Learning Trajectories from STEMIE.[131]

MYTH: "STEM is science only."

FACT: STEM stands for science, technology, engineering, and math. In early childhood, STEM learning can be integrated with at least two or more domains in an intentional, hands-on approach.

STEM is an acronym that stands for an intentional approach to using science, technology, engineering, and math in a hands-on and integrated way. For STEM to happen, two or more of these content areas mix with a real-world situation and hands-on exploration to solve a problem or create something new.

Source: STEM Starts Early: Grounding Science, Technology, Engineering, and Math Education in Early Childhood[141]

What Can I Do?

- Encourage children to explore using toys and items from nature in new ways. Or build an Inventor/Tinker Box together and encourage them to create something new.[100]
- Prompt them to find solutions while they play: "*It looks like you want to make the bridge cross over your river. What could you do to lengthen your bridge?"* For more examples of open-ended questions, see A Guide to Asking Open-Ended Questions.[53] Or follow STEMIE's daily prompt questions on Twitter.[130]
- Always consider how you can modify the environment, materials, and instruction for children as they explore. For example, if a child has trouble sitting, arrange the materials so that they can stand or lay on their belly. If the child has trouble grasping small toys, provide items that can more easily be grasped or modify the ones you have with household items such as rubber bands or tape or Velcro. See A Guide to Adaptations for more information about modifying the environment, materials, and instruction.[55]

MYTH: "Technology just means computer skills."

FACT: Technology is the introduction of underlying concepts of building or creating technology, including computational thinking.

According to Office of Educational Technology, the T in STEM is the introduction of underlying concepts of building or creating technology, including computational thinking, which is the basic logic underlying computer science, and should not be confused with technological devices (e.g., computer) or educational technology[140]. Computational thinking is a problem-solving process or method by which the 'what,' 'how,' and 'why' are determined.

Source: Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update[145]

What Can I Do?

- Increase understanding of technology by reading Guiding Principles for Use of Technology with Early Learners.[156]
- Learn more about why computational thinking is important for young children and ways to integrate Computational Thinking Skills[129] into daily routines, like Toothbrushing[111], and Daily Routine Explorations[111-119] from STEMIE.
- Listen to Computational Thinking in Early Childhood[28] and/or view STEMIEFest 2021: Computational Thinking for All Children[128] to learn more about computational thinking.
- Watch how a mom engages her child in foundational computational thinking while making ice cream sundaes.[41-42]

MYTH: "Engineering is a highly specialized skill set and is too difficult for young children to comprehend."

FACT: Young children engage in engineering during everyday play.

Engineering involves solving problems through asking questions, exploring materials, creating solutions, and improving these solutions.[134, 139, 152] Research suggests that young children engage in this engineering design process during everyday play.[134] In fact, a study by Lippard and colleagues identified three key engineering *habits of mind* (systems thinking, optimism, and collaboration), or ways of thinking, that preschoolers demonstrated within the art, block, sensory, and dramatic play spaces of the classroom.[139] These habits of mind appeared more often when early childhood educators actively engaged and nurtured children's engineering thinking during play.

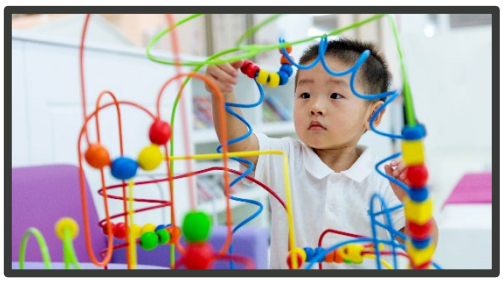
Source: STEM4EC Mythbuster Series #5[2]

What Can I Do?

- Learn more about habits of mind, and ways to engage and nurture children's engineering thinking in our STEM4EC blog - Mythbuster Series #5.[2]
- Reflect on the materials that you have available for your children in your learning spaces. Consider using A Guide to Adaptations to include each and every child in engineering activities and thinking.[55]
- Notice how children approach creating their solutions, and Ask Open-Ended Questions to extend their thinking and perhaps get them thinking of different ways to improve their solution.[53]

MYTH: "Math is adding and subtracting and/or counting only."

FACT: Math is far more than just adding and subtracting or counting. Math includes geometry, spatial reasoning, measurement, and patterning.



While basic arithmetic and counting are important math processes, math is far more than just adding and subtracting or counting. Math includes geometry, spatial reasoning, measurement, and patterning. All these mathematical processes can be used to solve problems, communicate why and how to solve problems, as well as understand structures and patterns, setting the foundation for later school success.

Source: Myths of Early Math[135]

What Can I Do?

- Learn more about what early math learning trajectories[30] look like for young children from STEMIE's PD Series and dig deeper into early math goals, progressions, and playful learning on the early math Learning Trajectories website[148].
- Encourage critical math skills at home with these fun and practical activities[22]:
  - Storybook Conversations[59-89]
  - Discovery Play Activities with Your Young Child[90-110]
  - Daily Routine Explorations with Your Young Child.[111-119]

MYTH: "STEM learning is expensive."

FACT: STEM learning opportunities and experiences are everywhere, and most often are completely free of charge.

There is no need to purchase expensive toys or materials to engage young children in STEM learning. STEM learning opportunities are everywhere. Adult-child interactions, not toys, are critical in supporting children's development across all domains of learning. For example, while preparing snacks, children can count a small number of dry ingredients that you are going to use and bring it to you. This is Math. While baking brownies, children may also experiment with measuring cups of varied sizes, and guess which one holds more, or observe how butter changes from solid to liquid when it melts. This is Math and Science. And following the recipe sequence of steps is technology, or Computational Thinking.

Source: STEM4EC Blog – Mythbuster Series #3[5]

What Can I Do?

- Encourage children to explore STEM learning concepts during mealtime and bath time. For more ideas, see STEMIE's resources for bath time[114, 118] and mealtime[112-113, 115-117].
- Intentionally provide STEM learning experiences and opportunities while asking open-ended questions. For more examples of open-ended questions, see A Guide to Asking Open-Ended Questions.[53] Or follow STEMIE's daily prompt questions on Twitter.[130]
- Visit STEM4EC's Blog[132] and STEMIE PD Series[29-33] to learn more about strategies to support STEM learning at home.
- Use the My STEM Adventure app to prompt children to interact with and take pictures of objects in their surroundings that fit the description of the prompt in order to introduce them to STEM concepts.[133]

MYTH: "STEM is not for infants and toddlers. Or it is only for older and/or gifted children."

FACT: STEM learning opportunities and experiences begin in infancy through a natural curiosity to explore their environment.

Infants and toddlers are natural explorers. During the first two years of life, they learn and develop fundamental STEM skills (e.g., critical thinking, problem-solving, making predictions) through exploring and interacting with people and objects in their environment. For instance, when they are playing with blocks, they might experiment with diverse ways of stacking or moving, which is a wonderful opportunity to develop critical thinking and problem-solving skills.

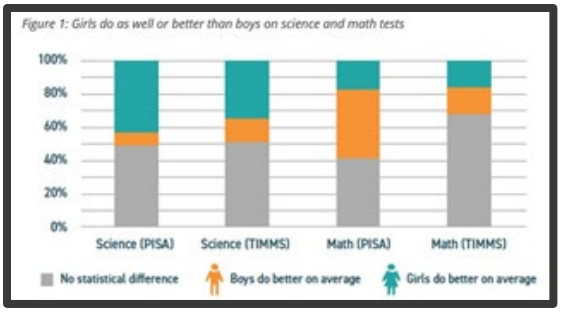
Source: STEM4EC Blog – Mythbuster Series #1[3]

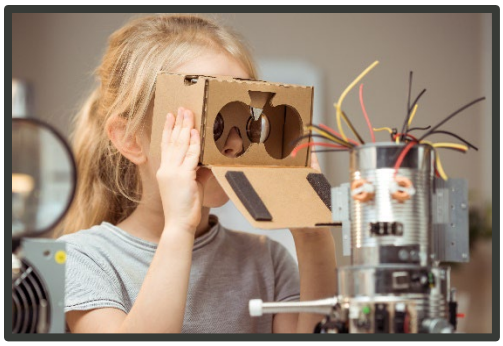
What Can I Do?

- Encourage infants and young children to explore STEM learning concepts. For more information, see STEMIE's Daily Routine Explorations.[111-119] For more ideas, see STEMIE's resources for bath time[114, 118] and mealtime[112-113, 115-117].
- Learn more about how to embed foundational STEM concepts and learning opportunities into daily routines and activities with STEMIE PD Series: Adaptations to Everyday Routines and Activities: Make STEM Happen for Infants and Toddlers.[29]

MYTH: "STEM is only for boys."

FACT: Girls do as well or better than boys on science and math tests.





Dr. Jessica Cantlon, a professor of developmental neuroscience at Carnegie Mellon University in Pittsburgh, has studied the brains of young children. She studied five hundred children ages 6 months to 8 years and found that even in infancy, boys and girls were equally interested in concepts involving numbers.[151] Two international assessments that measured older children's ability in math, science, and reading showed that girls do as well or better than boys on these tests.[149]

Sources:

- Math Myths: Are Boys Really Better at Math?[151]
- Myths and Misperceptions: Reframing the narrative around women and girls in STEM[149]

What Can I Do?

- Use science and math vocabulary with all children as you play and interact with them during daily routines and activities. Make patterns out of snack foods, count blocks as you make a tower, and narrate your child's actions as they engage with their world. See STEMIE's resources for activities during daily routines, like mealtime[112-113, 115-117].
- Read books about girls and women in STEM activities. Author Andrea Beaty has numerous children's books whose main character is a girl doing STEM activities. See Storybook Conversations: Rosie Revere, Engineer[73] as well as STEMIE's curated list of storybooks focused on Women in STEM[89].
- Support your child's interest in STEM and math activities! Extend their learning opportunities when they show interest and ask questions.

MYTH: "Language and literacy are more important than STEM."

FACT: All aspects of children's development are equally important and intertwined.

All aspects of children's development are equally important and intertwined. In fact, STEM, language, and literacy can go hand in hand. For example, during shared book reading, adults can ask open-ended questions, pose problems, and discuss STEM concepts with children. While answering the questions and engaging in conversation, children will also have opportunities to build their STEM vocabulary and knowledge.

Source: STEM4EC Blog – Mythbuster Series #2[4]

What Can I Do?

- Use Dialogic Reading[51] to have conversations on various STEM topics and find adaptation strategies to support young children with disabilities during story time. See Storybook Conversations[59-89] to learn more.
- Instead of asking 'yes/no' questions, ask open-ended questions to promote children's critical thinking skills and develop vocabulary to communicate their ideas. For examples of open-ended questions, please see A Guide to Asking Open-Ended Questions.[53]
- Visit STEM4EC Blog – Mythbuster Series #2 to learn more about the relationship between literacy and STEM, the benefits of dialogic reading for young children with or without disabilities, and engaging children in math at home.[4]
- For examples of books for young children about STEM topics, see STEMIE's Curated List of Storybooks[84] as well as:
    - Asian-Pacific Islander Heritage & Innovators in STEM[83]
    - Celebrating Black Innovators in STEM[88]
    - Disability in STEM[87]
    - Hispanic/Latino/a Heritage in STEM[85]
    - Native American Heritage in STEM[86]
    - Women Innovators in STEM[89]

STEMIE INNOVATION FOR INCLUSION IN EARLY EDUCATION

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20. Ramanathan, G. (2021). Incorporating Engineering Inquiry into Everyday Play [Web Log]. https://stem4ec.ning.com/blog/incorporating-engineering-inquiry-into-everyday-play?context=category-Practice
21. Sharifnia, E. (2021). Supporting Young Children's Science Learning at Home [Web Log]. https://stem4ec.ning.com/blog/supporting-young-children-s-science-learning-at-home?context=category-Practice
22. Stites, M. & Sonnenschein, S. (2021). Fostering Young Children's Mathematics Skills at Home [Web Log]. https://stem4ec.ning.com/blog/fostering-young-children-s-mathematics-skills-at-home?edited=1.
23. Towson, J. (2020). Reading Beyond the Book: Incorporating Dialogic Reading Strategies into your Storybook Reading [Web Log]. https://stem4ec.ning.com/blog/reading-beyond-the-book-incorporating-dialogic-reading-strategies?context=category-Storybook+Conversation
24. Vance, M. (2022). Positive Affirmations in STEM [Web Log]. https://stem4ec.ning.com/blog/positive-affirmations-in-stem?context=category-Insights
25. Yang, H. (2022). Infusing Family Culture in STEM Learning [Web Log]. https://stem4ec.ning.com/blog/infusing-family-s-culture-in-stem-learning
26. Yang, H., & Ostrosky, M. (2021). Embedding STEM learning opportunities into gross motor play: Tips and strategies to support preschoolers with disabilities [Web Log]. https://stem4ec.ning.com/blog/embedding-stem-learning-opportunities-into-gross-motor-play-tips-?context=category-Practice

STEMIE's STEM4EC Blog – STEM talkABLE:

27. DiPietro-Wells, R., & Wells, L. (Hosts). (2020). STEM talkABLE #1: "I am not different from anyone else" [Audio podcast episode]. STEMIE Center. https://stem4ec.ning.com/blog/stem-talkable-1-I-am-not-different-from-anyone-else?context=category-STEM+talkABLE
28. Verne, L., & Amsbary, J. (Hosts). (2021). STEM talkABLE #2: Computational Thinking in Early Childhood [Audio podcast episode]. STEMIE Center. https://stem4ec.ning.com/blog/stem-talkable-2-computational-thinking-in-early-childhood?context=category-STEM+talkABLE

STEMIE's Professional Development Webinar Series:

29. Campbell, P. (2021). *"Adaptations to Everyday Routines and Activities Make STEM Happen for Infants and Toddlers"* [Video File]. https://stemie.fpg.unc.edu/stemie-pd-series-adaptations-everyday-routines-and-activities-make-stem-happen-infants-and-toddlers
30. Clements, D., Sarama, J., West, T., & Chance, B. (2021). *"What Counts in Teaching and Learning for ALL Young Children? – Learning Trajectories for Young Children"* [Video File]. https://stemie.fpg.unc.edu/stemie-pd-series-what-counts-teaching-and-learning-all-young-children.
31. Dileso, M., & Iwamoto, S. (2021). "*STEAM the Child's Way with Boston Children's Museum"* [Video File]. https://stemie.fpg.unc.edu/stemie-pd-series-steam-childs-way-boston-childrens-museum
32. Lange, A., Trivette, C., & Carter, M. (2021). *"Playful STEM for All Young Children*: *Family and Equity"* [Video File]. https://stemie.fpg.unc.edu/stemie-pd-series-playful-stem-all-young-children-family-and-equity
33. Vinh, M., Lim, C., & Ellis, D. (2019). *"STEM Innovation for Inclusion in Early Childhood Education Introduction"* [Video File]. https://stemie.fpg.unc.edu/stemie-pd-series-introductory-webinar

STEMIE's Video Series:

34. Kanell, J. & Laser Pigeon Pictures (Producer). (2020). *STEM Starts Now* [Video]. YouTube. STEMIEFest 2020: A Virtual Conference. https://stemie.fpg.unc.edu/stemiefest/stem-starts-now.
35. STEMIE (Producer). (2019). *From Zero to Hero with a Calculator and Supports* [Video]. YouTube. https://stemie.fpg.unc.edu/zero-hero-calculator-and-supports.
36. STEMIE (Producer). (2021a). *Daily Routines: Mealtime* [Video]. YouTube. https://stemie.fpg.unc.edu/video-demo-daily-routines-mealtime
37. STEMIE (Producer). (2021b). *EdGames Expo21: STEM is Everywhere! Making STEM Happen for All Young Children* [Video]. YouTube. https://stemie.fpg.unc.edu/edgames-expo21-stem-everywhere-making-stem-happen-all-young-children
38. STEMIE (Producer). (2021c). *Why Inclusion: Key Characteristics of High Quality Inclusive Education* [Video]. YouTube. https://stemie.fpg.unc.edu/video-series-why-inclusion.
39. STEMIE (Producer). (2021d). *Why Inclusion: Let's Change Attitudes and Beliefs about Inclusion* [Video]. YouTube. https://stemie.fpg.unc.edu/video-series-why-inclusion.
40. STEMIE (Producer). (2021e). *Why Inclusion: Social Outcomes in Inclusion* [Video]. YouTube. https://stemie.fpg.unc.edu/video-series-why-inclusion.
41. STEMIE (Producer). (2022a). *Daily Routines: Ice Cream Sundae Preparation* [Video]. YouTube. https://stemie.fpg.unc.edu/stemie-video-demonstration-daily-routines-ice-cream-sundae-preparation
42. STEMIE (Producer). (2022b). *Daily Routines: Sequencing Sundae Toppings* [Video]. YouTube. https://stemie.fpg.unc.edu/stemie-video-demonstration-daily-routines-sequencing-sundae-toppings
43. STEMIE (Producer). (2022c). *Storybook Preparation* [Video]. YouTube. https://stemie.fpg.unc.edu/stemie-video-demonstration-storybook-preparation
44. STEMIE (Producer). (2022d). *Unfolding Understanding of Force and Motion* [Video]. 2022 STEM for all Video Showcase. https://stemforall2022.videohall.com/presentations/2362
45. STEMIE & Kansas Deaf-Blind Project (Producers). (2022a). *STEM Video Demonstration: Storybook Conversation for Rosie's Walk* [Video]. YouTube. https://stemie.fpg.unc.edu/stem-video-demonstration-storybook-conversation-rosies-walk
46. STEMIE & Kansas Deaf-Blind Project (Producers). (2022b). *STEM Video Demonstration: Storybook Preparation for Rosie's Walk* [Video]. YouTube. https://stemie.fpg.unc.edu/stem-video-demonstration-storybook-preparation-rosies-walk
47. STEMIE, Lee, A., & ArcTechnology (Producer). (2019). *From Zero to Hero with a Calculator and Supports* [Video]. YouTube. https://stemie.fpg.unc.edu/zero-hero-calculator-and-supports

STEMIE's Guides:

48. Pedonti, S. (2021). *A How-To Guide for Adaptations to Storybooks* [PDF]. STEMIE. https://stemie.fpg.unc.edu/how-guide-adaptations-storybooks
49. Sam, A., Waters, V., & Lim, C. (2021). *A Guide to Cross-Cutting Concepts* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-cross-cutting-concepts
50. STEMIE. (2021f). *A Guide for General Adaptations for Storybook Conversations* [PDF]. STEMIE. https://stemie.fpg.unc.edu/dialogic-reading-general-adaptations
51. STEMIE. (2021g). *A Guide for Storybook Conversations & Dialogic Reading* [PDF]. STEMIE. https://stemie.fpg.unc.edu/dialogic-reading-very-hungry-caterpillar
52. Waters, V., Lim, C., & Vinh, M. (in development). *A Guide to Reflection* [PDF]. STEMIE.
53. Waters, V., & Lim, C. (2021). *A Guide to Asking Open-Ended Questions* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-asking-open-ended-questions
54. Waters, V., Harradine, C., & Lim, C. (2021). *A Guide to Child-Level Processes* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-child-level-processes
55. Waters, V., West, T., Lim, C., & Vinh, M. (2022). *A Guide to Adaptations* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-adaptations
56. Waters, V., West, T., Lim, C., Campbell, P., & Pedonti, S. (2022). *A Guide to Teaching Practices* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-teaching-practices
57. Yang, H., Waters, V., Lim, C., Pedonti, S., & Harradine, C. (2022). *A Guide to Addressing STEM Myths* [PDF]. STEMIE. https://stemie.fpg.unc.edu/guide-addressing-stem-myths

STEMIE's Storybook Conversations with Your Young Child Series:

58. STEMIE. (2022d). *Storybook Conversations – Astro Girl by Ken Wilson-Max* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-astro-girl
59. STEMIE. (2022e). *Storybook Conversations – Baby Loves Quarks! by Ruth Spiro* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-baby-loves-quarks
60. STEMIE. (2022f). *Storybook Conversations – Bear in a Square by Stella Blackstone* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-bear-square
61. STEMIE. (2022g). *Storybook Conversations – Counting Kisses by Karen Katz* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-counting-kisses
62. STEMIE. (2022h). *Storybook Conversations – Feathers and Hair. What Animals Wear by Jennifer Ward* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-feathers-and-hair-what-animals-wear
63. STEMIE. (2022i). *Storybook Conversations – Hello World! Solar System by Jill McDonald* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-hello-world-solar-system
64. STEMIE. (2022j). *Storybook Conversations – How Big is a Foot? by Rolf Myller* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-how-big-foot.
65. STEMIE. (2022k). *Storybook Conversations – I See Patterns by Linda Benton* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-i-see-patterns.
66. STEMIE. (2022l). *Storybook Conversations – Luna's Yum Dim Sum by Natasha Yim* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-luna%E2%80%99s-yum-yum-dim-sum.
67. STEMIE. (2022m). *Storybook Conversations – Moo, Baa, La La La by Sandra Boyton* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-moo-baa-la-la-la
68. STEMIE. (2022n). *Storybook Conversations – Mouse Paint by Ellen Stoll Walsh* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-mouse-paint
69. STEMIE. (2022o). *Storybook Conversations – Mr. Brown Can Moo, Can You? by Dr. Seuss* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-mr-brown-can-moo-can-you.
70. STEMIE. (2022p). *Storybook Conversations – Not a Box by Antoinette Portis* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-not-box.
71. STEMIE. (2022q). *Storybook Conversations – One Duck Stuck by Phyllis Root* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-one-duck-stuck.
72. STEMIE. (2022r). *Storybook Conversations – Pete the Cat and His Four Groovy Buttons by Eric Litwin* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-pete-cat-and-his-four-groovy-buttons
73. STEMIE. (2022s). *Storybook Conversations – Rosie Revere, Engineer by Andrea Beaty* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-rosie-revere-engineer.
74. STEMIE. (2022t). *Storybook Conversations – Rosie's Walk by Pat Hutchins* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-rosies-walk.
75. STEMIE. (2022u). *Storybook Conversations – Six Dinners Sid by Inga Moore* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-six-dinners-sid.
76. STEMIE. (2022v). *Storybook Conversations – Ten Apples Up On Top by Dr. Seuss* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-ten-apples-top
77. STEMIE. (2022w). *Storybook Conversations – Ten Black Dots by Donald Crews* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-ten-black-dots.
78. STEMIE. (2022x). *Storybook Conversations – The Grouchy Ladybug by Eric Carle* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-grouchy-ladybug.
79. STEMIE. (2022y). *Storybook Conversations – The Hike by Alison Farrell* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-hike
80. STEMIE. (2022z). *Storybook Conversations – The Snowy Day by Ezra Jack Keats* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-snowy-day.
81. STEMIE. (2022ab). *Storybook Conversations – Up to My Knees by Grace Lin* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-my-knees.
82. STEMIE. (2022ac). *Storybook Conversations – We Are Water Protectors by Carole Lindstrom* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-we-are-water-protectors

STEMIE's Curated List of Books related to STEM:

83. STEMIE. (2021h). *Storybook Conversations – Celebrating Asian Pacific Heritage in STEM* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-celebrating-asian-pacific-heritage.
84. STEMIE. (2021i). *Storybook Conversations – Curated STEM Book List* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-curated-list-books.
85. STEMIE. (2021j). *Storybook Conversations – Hispanic & Latino/a in STEM* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-hispanic-latinoa-stem
86. STEMIE. (2021k). *Storybook Conversations – Native American Heritage in STEM* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-native-american-heritage-stem
87. STEMIE. (2021l). *Storybook Conversations – STEM & Disabilities* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-stem-disabilites
88. STEMIE. (2022ad). *Storybook Conversations – Celebrating Black STEM* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-celebrating-black-stem.
89. STEMIE. (2022ae). *Storybook Conversations – Women Innovators in STEM* [PDF]. STEMIE. https://stemie.fpg.unc.edu/storybook-conversations-women-innovators-stem

STEMIE's Discovery Play Activities with Your Young Child Series:

90. Amsbary, J. (2021). *Discovery Play Activities with Your Young Child: To the Moon!* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-moon
91. Amsbary, J. (2022b). *Discovery Play Activities with Your Young Child: Coding with Lego Blocks* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-coding-lego-blocks.
92. Amsbary, J., Pedonti, S., & Waters, V (2021). *Discovery Play Activities with Your Young Child: Ice Cream!* [PDF]. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-ice-cream
93. Campbell, P., Waters, V., & Lim, C. (2021). *Discovery Play Activities with Your Young Child: Making Pancakes* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-making-pancakes
94. Figuereo, C (2022). *Discovery Play Activities with Your Young Child: What Makes a Shadow?* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-what-makes-shadow
95. STEMIE (2022af). *Discovery Play Activities with Your Young Child: Counting Birds and Other Things that Fly* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-counting-birds-other-things-fly
96. STEMIE (2022ag). *Discovery Play Activities with Your Young Child: Kitchen Band* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-kitchen-band
97. STEMIE. (2022ah). *Discovery Play Activities with Your Young Child: Blocks* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-blocks.
98. Waters, V. (2021a). *Discovery Play Activities with Your Young Child: Gardening* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-gardening.
99. Waters, V. (2021b). *Discovery Play Activities with Your Young Child: Meteorites & Craters* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-meteorites-craters.
100. Waters, V. (2022a). *Discovery Play Activities with Your Young Child: Inventor Box* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-inventor-box.
101. Waters, V. (2022b). *Discovery Play Activities with Your Young Child: Sorting Leaves* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-sorting-leaves
102. Yang, H. & Waters, V. (2022). *Discovery Play Activities with Your Young Child: Peek-a-boo* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-peek-boo.
103. Yang, H. (2021a). *Discovery Play Activities with Your Young Child: Sink or Float?* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-sink-or-float.
104. Yang, H. (2021b). *Discovery Play Activities with Your Young Child: Nature Scavenger Hunt* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-nature-scavenger-hunt.
105. Yang, H. (2021c). *Discovery Play Activities with Your Young Child: Color Hunt* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-color-hunt.
106. Yang, H. (2021d). *Discovery Play Activities with Your Young Child: Paper Airplanes* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-paper-airplanes.

STEMIE's Discovery Play Activities with Your Young Child Series (continued):

107. Yang, H. (2022a). *Discovery Play Activities with Your Young Child: String Telephone* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-string-telephone.
108. Yang, H. (2022b). *Discovery Play Activities with Your Young Child: Outdoors* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-outdoors.
109. Yang, H. (2022c). *Discovery Play Activities with Your Young Child: Playing with a Ball* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-playing-ball.
110. Yang, H., Waters, V., & Lim, C. (2022). *Discovery Play Activities with Your Young Child: Walking Rainbow* [PDF]. STEMIE. https://stemie.fpg.unc.edu/discovery-play-activities-your-young-child-walking-rainbow.

STEMIE's Daily Routine Explorations with Your Young Child Series:

111. Amsbary, J. (2022c). *Daily Routine Explorations with Your Young Child: Sequencing & Algorithms* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-sequencing-algorithms
112. STEMIE (2021k). *Mealtime Explorations for Young Toddlers* [PDF]. STEMIE. https://stemie.fpg.unc.edu/mealtime-explorations-young-toddlers
113. STEMIE. (2021l). *Mealtime Explorations for Infants* [PDF]. STEMIE. https://stemie.fpg.unc.edu/mealtime-explorations-infants.
114. Waters, V. (2021c). *Daily Routine Explorations with Your Young Child: Bath Time for Infants* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-bath-time-infants.
115. Yang, H. (2021e). *Daily Routine Explorations with Your Young Child: Mealtime for Infants* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-mealtime-infants.
116. Yang, H. (2021f). *Daily Routine Explorations with Your Young Child: Mealtime for Toddlers* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-mealtime-toddlers.
117. Yang, H. (2021g). *Daily Routine Explorations with Your Young Child: Mealtime for Preschoolers* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-mealtime-preschoolers.
118. Yang, H. (2021h). *Daily Routine Explorations with Your Young Child: Bath Time for Toddlers* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-bath-time-toddlers.
119. Yang, H. (2022i). *Daily Routine Explorations with Your Young Child: Laundry Sort* [PDF]. STEMIE. https://stemie.fpg.unc.edu/daily-routine-explorations-your-young-child-laundry-sort

STEMIE's Explorations & Adaptations Series:

120. Clements, D., Sarama, J., Waters, V., & Harradine, C. (2022). *Investigation & Adaptations: Circles & Cans* [PDF]. STEMIE. https://stemie.fpg.unc.edu/investigation-adaptations-circles-cans
121. Waters, V., & Harradine, C. (2022a). *Adaptations for Art* [PDF]. STEMIE. https://stemie.fpg.unc.edu/adaptations-visual-cues-art
122. Waters, V., & Harradine, C. (2022b). *Explorations & Adaptations for Birds* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-birds
123. Waters, V., & Harradine, C. (2022c). *Explorations & Adaptations for Nature Walk* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-nature-walk
124. Waters, V., & Harradine, C. (2022d). *Explorations & Adaptations for Sand* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-sand
125. Waters, V., & Harradine, C. (2022e). *Explorations & Adaptations for Smelling the Flowers* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-smelling-flowers
126. Waters, V., & Harradine, C. (2022f). *Explorations & Adaptations for Trees* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-trees
127. Waters, V., & Harradine, C. (2022g). *Explorations & Adaptations for Water* [PDF]. STEMIE. https://stemie.fpg.unc.edu/exploration-ideas-adaptations-water

Additional STEMIE Resources:

128. Amsbary, J. (2021). *"Computational Thinking for All Children"* [Video File]. STEMIEFest 2021. Hubilo. https://events.hubilo.com/stemiefest-2021/booth/49316
129. Amsbary, J., & Anderson, J. (2020). *"Computational Thinking for Each and Every Child"* [Video File]. STEMIEFest 2020: A Virtual Conference. https://stemie.fpg.unc.edu/stemiefest/computational-thinking-each-and-every-child.
130. STEMIE, [@STEMIIEE]. (n.d.). *Cultivate your child's STEM learning with our daily prompts!* [Twitter Profile].
131. STEMIE. (2019a). Learning Trajectories. STEMIE. https://stemie.fpg.unc.edu/our-work/learning-trajectories.
132. STEMIE. (2019b). STEM4EC Blog [Web Log]. STEMIE. https://stem4ec.ning.com/blog.
133. STEMIE, Bridge Multimedia, & Fable Vision. (Currently testing). *My S.T.E.M. Adventure* [Application]. Frank Porter Graham Child Development Institute. https://my-stem-adventure.fpg.unc.edu/#/

Articles/Reports:

134. Blank, J. & Lynch, S. (2018). Growing in STEM: The design process: Engineering practices in preschool. *Young Children (73)*, 4. https://www.naeyc.org/resources/pubs/yc/sep2018/design-process-engineering-preschool.
135. Clements, D. H., & Sarama, J. (2018). Myths of early math. *Education Sciences*, *8*(2), 71. https://www.mdpi.com/2227-7102/8/2/71#cite.
136. Clements, D. H., Vinh, M., Lim, C. I., & Sarama, J. (2020). STEM for inclusive excellence and equity. *Early Education and Development*, *32*(1), 148-171. https://www.researchgate.net/publication/341249563_STEM_for_Inclusive_Excellence_and_Equity.
137. ECSTEM. (2017). *Early STEM Matters: Providing High-Quality STEM Experiences for All Young Learners* [PDF] Early Childhood STEM Working Group. https://d3lwefg3pyezlb.cloudfront.net/docs/State_EC_STEM_Standards_Dec2016.pdf.
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139. Linder, S. M., Emerson, A. M., Heffron, B., Shevlin, E., Vest, A., & Eckhoff, A. (2016). "STEM Use in Early Childhood Education: Viewpoints from the Field." *Young Children* 71 (3): 87–91.
140. Lippard, C. N., Lamm, M. H., Tank, K. M., & Choi, J. Y. (2019). Pre-engineering thinking and the engineering habits of mind in preschool classroom. *Early Childhood Education Journal, 47*(2), 187-198.
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