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# HOW NATURE ENGAGES YOUNG MINDS TO BUILD STEM/STEAM SKILLS?

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**How Nature Engages Young Minds to Build STEM/STEAM Skills?**

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## **Abstract**

My interactions with children in classrooms, my experiences, and my observations in early childhood settings make me reflect and realize that even though we often use terms such as broad, exhaustive, and comprehensive to describe content areas in early childhood, very little STEM (Science, Technology, Engineering and Math) or STEAM (Science, Technology, Engineering, Art and Math) learning actually occurs within the classroom. We focus mainly on language and literacy in the early years, since most preschool teachers' do not show any interest in teaching STEM/STEAM subjects. This paper focuses on the importance of building STEM/STEAM skills in early childhood settings and discusses how nature and outdoor activities contributes to STEM/STEAM skill development among children through explorations, observations, and findings. The study also suggests that students need to explore and teachers need to integrate STEM/STEAM in early childhood and elementary curriculum to offer students unlimited opportunities in learning scientific concepts. In the workshop sessions, I will discuss many different activities that build STEM/STEAM skills among children in early childhood classrooms along with hands-on opportunities. Participants will also learn how to create nature inspired STEM/STEAM activities and get take away lesson plans to implement such activities in their classrooms.

## **Introduction**

Though many people term STEM and STEAM as acronyms, in reality, they are just a way of thinking about how teachers can engage students to integrate knowledge across all disciplines in a cohesive way. Teachers need to engage students in STEM and STEAM content and integrate knowledge from all areas. Unfortunately, it is frequently seen that the teachers are not comfortable enough to teach STEM/STEAM material in their own classrooms. 21st century

learning does not support the traditional method of learning as being the best way for children to learn new things. Children need to be given opportunities to learn by exploring and discovering in outdoor environments. I give my students abundant opportunities to investigate ideas in a variety of settings, both indoors and outdoors. For example, instead of making children learn to count and do math through the use of counters and flash cards in the classroom, I prefer to take them outside to explore and count real objects such as rocks, leaves, acorns, pinecones, and flowers. To teach scientific concepts such as heaviness vs. lightness, big vs. small, hard vs. soft, day vs. night, and light vs. dark, I encourage kids to go outdoors to explore nature. Since natural settings offer unlimited opportunities for children in STEM learning, the teacher just facilitates the interplay between the child and the environment. I prefer to play the role of a facilitator and to encourage my students to explore and use their senses to find and discover new things when we go outside. “Young children are motivated to explore the world around them, and early science experiences can capitalize on this inclination.” (French, 2004). My observations tell me that children are much happier when they are allowed to explore, experiment, discover, and find what they will learn and how they will learn it from their surroundings by themselves.

### **What is STEM/STEAM and Science in the early years of learning?**

STEM/STEAM education in early childhood years is an inquiry based approach to promote learning in science, technology, engineering, art, and math by interconnecting all of these disciplines. Since early exploration sets the stage for later learning, it is in the preschool and lower elementary years that children develop science skills to become natural scientists. By using interdisciplinary approaches, teachers can integrate STEM/STEAM learning into their curriculums. I believe that science is all about exploring, experimenting, observing, asking questions, and making predictions. Educators and teachers need to increase their knowledge of

how they can support STEM/STEAM learning environments by providing opportunities for students to explore nature and its surroundings. They must look for opportunities to develop a child's ability to understand STEM/STEAM concepts and skills by asking them questions and engaging their young minds to explore and investigate in outdoor settings.

Science is not merely the memorization of facts or rote learning. Science is not just textbook learning. Rather, science is what we are actually doing in order to make things work. Science is all about exploring, experimenting, observing, and asking questions about how we can do this. Children are generally curious and love to explore opportunities to figure out how to make things work, even if the thing is a piece of toy. During my interactions and interviews with children, such expressions, desires, and thoughts have been shown and expressed to me time and time again.

### **STEM to STEAM**

I have discussed before that STEM and STEAM are more than just acronyms. When Art is added to STEM, it becomes STEAM, and this not only provides an interesting approach to teaching and learning but also allows children to be more creative and innovative. Art brings out the artistic side of children by capturing their imaginations when drawing, coloring, and even scribbling during their early years. Researchers beliefs and practical experiences show that we can easily integrate arts into the core content areas of early childhood and elementary curriculums. Art allows students and children to become more articulate in interpreting their creativity, thoughts, and expressions. 21st century learning requires educators to integrate arts and scientific concepts into project-based learning to enable students to be not only creative, but also to become critical thinkers. The synthesis of learning takes place when we educators combine STEM with STEAM in an interconnected way that makes learning fun, interesting, and

opens up creative opportunities for students. The examples provided in the pictures below show how children can learn about shapes, sizes, counting shapes (mathematical concepts), and ways to implement them into their art projects. This is an example of integrating STEM to STEAM in the early years of learning.



In the picture above, children are trying to figure out how to make and tinker with many different materials to build STEM skills in a science class.



In the picture above, children are learning about shapes, sizes, how to count, and how to integrate their ideas from STEM to STEAM by showing creativity in Cat Art.

### **Learning by Asking Questions, Exploring, and Discovering**

One of the key strategies in STEM/STEAM learning is to ask great questions, and by allowing my students to ask questions, investigate, and find answers without immediately giving them away, I expand my students' science learning skills within my classroom. When teachers increase children's natural curiosity by asking open-ended questions, learning becomes more meaningful and fun for children. "An open-ended (divergent) question can conclude with an 'Other comments' section, or a request for the interviewees to 'add anything else' they would like to. In doing so, one provides students with opportunities to elaborate on questions in ways that you had never anticipated." (Geoffrey E. Mills, 2011).

### **How Nature engage young minds in STEM/STEAM learning?**

It became clear to me during my observations, interviews, and interactions with students and teachers that learning takes a different path when children are allowed to engage in discoveries and experimentations in outdoor settings inspired by nature. Children not only learn better through playing and exploring, but they are also able to socialize and interact with their peers. These discoveries and interactions in natural settings provide first-hand learning experiences among children, enabling them to use their basic senses to develop STEM/STEAM skills. Thus, STEM/STEAM skills also play a great role in helping children to socialize, especially when they are working in groups. Teachers and educators must engage students in various outdoor activities such as walking in nature, playgrounds, and beaches, touring parks, and visiting gardens. All of these places offer many different opportunities to discuss and talk about one's findings, both big and small. Second, teachers must expand on a child's imagination by asking questions. Asking students good questions such as "What did you see by the beach or in the garden?" or "Where did you see the squirrel and the cat and how did they look?" or "What else did you see in the garden?" will make them feel more engaged and responsive. You will be flooded with answers of all of the experiences that they have seen, heard, and touched through their descriptions. Third, if possible, plant a mini garden with your children or students. Let them dig through the dirt with their tiny shovels, water the seeds and plants by using little watering cans, or touch, smell, and appreciate the flowers and the leaves, feeling the different textures. Let them narrate to you their expressions of scientific concepts that help build STEM/STEAM skills.

Finally, go for discovery walks with your children or students in the beach to discover rocks, pebbles, sea-shells, and sand. They can also be taken to the garden or park to discover plants and trees, flowers and leaves, and acorns and pinecones. In the stores, kids can shop for groceries,

fruits, and vegetables. In the zoo, they can visit their animal friends and learn more about them. All of these discovery walks are excellent opportunities that engage children to explore and make new findings and then engage in conversations and interactions with peers, teachers, and parents to talk more about them.

Take photos with your students or children whenever you visit places such as the park, garden, museum, beach, or backyard and later turn them into opportunities for discussions. Bring a camera to take photos of plants or animals or anything interesting that you see in nature. Since young children and students learn best by exploring their surroundings and what they see around them, these opportunities help them develop STEM/STEAM skills. Young children can point out their discoveries by engaging in picture discussions and talks amongst themselves. Thus, exploring the outdoors creates unlimited opportunities of learning for children who are naturally curious, which paves the road to more STEM/STEAM learning.

Finally, educators must ask more “what” questions and invite children to explore, observe, discover, find, and communicate. Early childhood educators must help children acquire the skills they need in order to strengthen their scientific concepts through discoveries, experimentations, explorations, findings, conversations, and discussions, where kids can share and exchange views of their surroundings. I strongly believe that STEM/STEAM teachings should be enjoyable and full of curiosity for children.

### **Read Nature inspired story books with your children**

Another fantastic way to inspire children to take part in more STEM/STEAM learning is to regularly read a variety of nature inspired story books with them in the classroom or at home, so that children can make connections with their understandings and explorations of what they see, hear, and read in books. I read nature inspired books with my students in the classroom. I

also enjoy engaging in discussions with them and sharing facts about the books we have read. A few children's books that I read with them are listed below:

- The Backyard Books series: *Are you a Ladybug? Are You a Butterfly? Are You an Ant? and Are You a Spider?*
- *Birds and My Garden* by Kevin Henkes
- *Little Cloud and The Very Hungry Caterpillar* by Eric Carle
- *Commotion in the Ocean* by Giles Andreae
- *Guess Whose Shadow?* by Stephen R. Swinburne
- *About Habitats: Wetlands* by Cathryn Sill.

#### **Findings that children learn and build STEM/STEAM skills exploring in Nature**

The study found that abundant opportunities exist for children to explore nature everywhere, such as the farm, the zoo, the park, the beach, and the backyard. Children use their senses and vocabulary to express what they see and discover in nature. Through exploration and experimentation in their early years, they learn about STEM/STEAM skills. When they are inspired to explore nature, count rocks and leaves, take walks in nature, and play with sand, children get hands-on opportunities. Playing with building blocks, making rockets with plastic or paper straws, planting seeds, and similar experiences help children problem-solve and think critically. Similarly, engaging in art activities such as water painting, creating animals, and shapes with dough, drawing with crayons and chalks, brush or finger painting, and many more activities provides excellent opportunities to gain the mastery of art. Thus, a curriculum planned with the disciplines of STEM/STEAM (Science, Technology, Engineering, Art and Math) can integrate fun into a child's learning experiences. Children explore many possibilities by indulging in play and other activities that support their learning, enrichment, and sense of

development. Early Childhood professionals must build STEM/STEAM curriculum skills as a 21st-century learning approach with many different opportunities in order to help children engage in inquiry-making, critical thinking skills, and artistic expressions.

### **Conclusion**

This interactive, hands-on workshop will address STEM/STEAM learning in nature with rocks, shells, plants, leaves, flowers, and other materials. Participants will focus on ways to set up their environment, learn strategies that provoke a child's natural curiosity, and get take away lesson plans and other materials to design STEM activities with children in their classrooms. A few activities are listed below that show how nature engages young minds in STEM/STEAM skill building:

1. ***Shadow Chalk Play.*** Take children outside at different times of the day and trace your shadows onto the sidewalk or driveway with sidewalk chalk. Ask the following open-ended questions to children: “How is your shadow like you? How is it different? How did your shadow change?” (science concepts).
2. ***Shadow Play.*** Have your child create or trace different shapes to cut out. Glue or tape popsicle sticks or drinking straws onto the base as holders. Create a simple play with your child by making the characters (dinosaurs, animals, people, dolls) dance in the sun.
3. ***Shadow Walk.*** Ask your child, “Where is your shadow? Can you see which one is mine and which one is yours?”. Jump up and down, wiggle your legs, and wave your arms. Ask them, “What happens to our shadows when we jump? Do they become longer or shorter?”.
4. ***Leaf Play and Art.*** Take your students outside and see if they notice a leaf, then

take some time to smell and touch it. Talk about its shape and color. See if you can find the tree that the leaf came from. You can trace the leaves, do leaf rubbings on the bark of the trees in the park or in the backyard, and find out if the leaves float or sink in water (science concepts).

5. ***Buddy Watering Plants.*** Take your children outside and have each of them choose a buddy. Give them small watering cans to fill and then water the plants and flowers. Ask questions such as “What happened to the seeds that you planted a week back, does the little plants have any leaves, flowers or stem?”. Ask them if they know about how plants make food (science concepts).
6. ***Practicing Pouring.*** Take children outside and give them water toys, plastic cups, glasses, and pitchers. Ask them to fill up the containers with water and then practice pouring water into other containers. Ask them about water spills. This is a nice play engagement to learn about pouring water from containers.
7. ***Counting Rocks and Shells.*** If you are near the beach, make your children take a walk on the beach with you. Start collecting seashells or little rocks and make them sort the collected materials by color, structure, or size in muffin tins to determine scientific concepts, to develop sorting skills, and to practice counting (math concepts).
8. ***Tracing, Cutting, Coloring and Collaging.*** Learn how Eric Carle traces, cuts, and glues his lively illustrations by watching the short video at [http://www.eric-carle.com/slideshow\\_collage.html](http://www.eric-carle.com/slideshow_collage.html) (art concepts). All of these hands-on activities help children develop STEM/STEAM skills.
9. ***Nature Walk.*** Take children outdoors for a walk along the neighborhood or by

the beach. Let children collect acorns, pinecones, dried leaves, flowers, sea-shells, rocks, and much more for counting, sorting, and matching sizes (math concepts).

10. ***Engineering with Legos and Blocks.*** Engineering starts with Legos, small blocks, unit blocks, and recycled items such as plastic, egg cartons, and boxes of all sizes during the early childhood years. Children like to build bridges, tall buildings, and ramps. Teach children how to compare the different sizes of buildings and bridges. Children learn about scientific concepts when they play and explore with blocks and Legos.

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