

# STEAM in Preschool Architecture & Novel Engineering

Ritenour School For Early Childhood Education  
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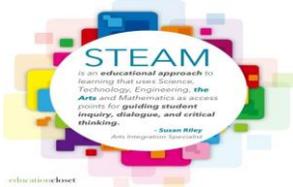
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## What is STEAM?



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## Why STEAM?

- "Research shows that the earlier we guide and support children's wonder about the world--and thereby identify opportunities for children to acquire foundational STEM skills--the more successful they are in all areas of learning later on in life." -NAEYC
- The National Science Board (NSB; 2010): U.S. economic Although 28% of college students begin as STEM majors, about half will either switch majors or drop out of school before graduating (Chen & Soldner, 2013).
- Half of all current jobs will be done by a computer or robot by 2030, although there are now 500,000 open jobs in computer science. There are only 40,000 new CS majors graduating nationwide (Washington Post, December 16, 2016).
- Early exposure to STEAM supports children's overall academic growth, develops early critical thinking and reasoning skills

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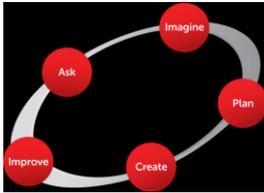
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### Design Thinking Process



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### Architecture in Preschool

Architecture is the art of planning, designing, and building structures.



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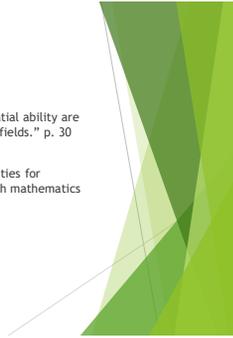
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### Why Architecture?

"Nurturing Student creativity, math achievement and spatial ability are each important for increasing overall readiness for STEM fields." p. 30

"Incorporating the study of architecture involves possibilities for creativity, spatial demands, and student engagement with mathematics concepts such as scale, proportion, and patterns." p. 31

(Senne , Coxon 2016 )



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### Benefits of Architecture

- Improves fine motor manipulation and strength
- Improves hand eye coordination
- Enhances spatial awareness
- Provides opportunities to practice thinking and reasoning skills
- Improves focus and patience
- Improves confidence and creativity
- Extends building into imaginary play
- Develops basic mathematic and geometry skills
- Explores scientific aspects of building



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### Missouri Early Learning Standards

#### Mathematics

##### II Geometry and Spatial Sense

1. Investigates positions and locations.
2. Explores shapes in the environment.

##### III Patterns and Relationships

1. Recognizes relationships in the environment.
2. Uses patterns in the environment.

##### IV Measurement

1. Makes comparisons.
2. Uses measurement.



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### What Architecture looks like

- ◆ Students complete different activities that address scale, plan, elevation, model, and site which are the basic components of architecture
- ◆ Students use creativity and problem solving to plan and build various types of structures
- ◆ Students use fine motor skills and knowledge of positions, shapes, and patterns to create
- ◆ Students use problem solving skills to test the functionality of structures built



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### Artifacts



Blue Prints & Blocks



Marshmallow Structures



Q-Tip Dome



Tinker Toothpick Structure



Lego & Foam Tube Marble Maze

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### Novel Engineering

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### What is Novel Engineering?

An integrated approach to teaching engineering, problem solving, and literacy.

### Benefits of Novel Engineering

- It is a new way to demonstrate comprehension.
- It enhances the comprehension of text as students search for details about their problem/solutions.
- It introduces students to rich, often realistic engineering problems.
- It emphasizes problem-solving and teamwork skills.
- It meets common core and next generation science standards.
- It's a natural way to extend literature within your classroom and formalizes it.

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### Missouri Early Learning Standards

#### Speaking - Expressive Language

- Uses expanded vocabulary
- Uses language to communicate

#### Listening/Receptive Language:

- Listens for different purposes.

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### What does Novel Engineering look like?

1. **Read a book and identify problems-** Through discussion and attentive reading, students collect problems that characters face.
2. **Scope problems and brainstorm solutions-** Students consider the needs of the story's character/client and the context/ constraints imposed by the text as they brainstorm possible solutions.



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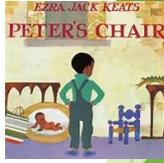
### What does Novel Engineering look like?

Book: Peter's Chair

**Problem-** The chair was too small for Peter's body.

**Possible Solutions (students' response)**

1. "throw it away"
2. "fix it to make it fit"
3. "give Peter a chair that is his size"
4. "make it bigger with tools"
5. "take it apart and put it back together but bigger"




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### Design Sheet




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### What does Novel Engineering look like?

**3. Design a solution-**  
Students work in teams to plan and build a functional prototype that addresses the character's needs and constraints.




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### What does Novel Engineering look like?

**4. Get feedback-** Students test their solutions as they build and get feedback from their teachers and/or peers.

**5. Improve designs-** Students use information gathered during testing and presentations to improve and revise their designs



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### What does Novel Engineering look like?

**6. Share-** Teams can either present their final solution or reflections on their process to the class, write a story that includes their solution, or make advertisement for their solution.



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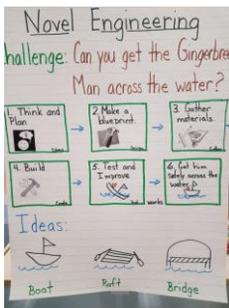
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### School Wide Challenge #1

- Monthly
- One Topic/Book
- Displayed in common area

Build a fence for the 5 little pumpkins!



Book  
Pete the Cat  
5 Little Pumpkins



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### School Wide Challenge #2

Build a trap to catch the Gingerbread Man!

Books  
The Gingerbread man  
The Gingerbread Girl!



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### Today's Challenge

Materials:  
Ziploc bag with dots and toothpicks

Directions:  
Use the dots and toothpicks to build a truss bridge.



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