



# Engineering for Preschoolers!



## Ways to encourage engineering at home with your child(ren).

1. **Look for and provide ways** for them to experiment and explore using a wide variety of building materials. Encourage them to find ways to construct structures, vehicles, robots, animals, etc.
  - a. blocks (variety of sizes and materials, open-ended types)
  - b. natural items (wood, branches, rocks), recycled items (empty cardboard boxes, cardboard tubes, plastic containers & bottles, etc.)
2. **Keys to success:** Allow the child to be actively involved with the building project - NO worksheets!
  - a. Encouraging your child to create a plan by drawing their proposed structure on a plain piece of paper is a great strategy (if appropriate for the developmental level of child)
  - b. **Look for those incidental learning moments** (unplanned, spontaneous) and take time to discuss and explore with your child!
    - i. introduce vocabulary such as: balance, fast, slow, angle, structure, construct, increase, decrease, weight, tall, short, identify shapes (3D)
    - ii. interact and share information freely, avoid quizzing your child
  - c. **All children learn in their own way and in their own time** - allow flexible time constraints to best meet your child's learning needs.
  - d. Note: it's perfectly acceptable for the end product to not resemble the plan - remember we are focusing on the process NOT the end product.

***Your excitement and interest in engineering and building will be the spark to ignite your child's love for learning!***

*\*For more information (research and dig deeper section) on engineering and preschoolers see the complete handout posted on ValleyBible.net under SPROUTS.*



# Engineering for Preschoolers!

**Engineering is IMPORTANT: Here's what the research tells us:**



"Recently, the field of education has experienced a push to develop the STEM (Science, Technology, Engineering, and Math) skills that are important to success in the 21st century. **Through play with objects – blocks, sand, balls, crayons, and paper – children begin to understand logical scientific thinking, such as the concept of cause and effect.**"

(Gelfer & Perkins, 1988; Ginsberg, Inoue & Seo, 1999; Piaget, 1962; Ness & Farenga, 2007).

*"Wolfgang, Stannard, & Jones (1996) followed a group of 37 children over 16 years and found that the complexity of their play with blocks as 4-year-olds was significantly and positively related to their level of achievement in mathematics during middle and high school, even controlling for IQ and gender."*

**"It is important to keep in mind, however, that to solve every problem, young children do not need to move through each stage of engineering cycle in the exact order, nor do they need to move through the entire engineering cycle"** (Van Meeteren and Zan, 2010)

**"The informal understanding children gain through experimentation, observation, and comparison in play lays the foundation for higher-order thinking and later learning of formal STEM concepts"** (Bergen, 2009; Ginsberg, 2006; Shaklee et al., 2008 as cited in Fisher et al., 2011; Tepperman, 2007).

# Engineering for Preschoolers!



**Dig Deeper into Engineering:** Information from the Science Buddies website:  
<https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps#keyinfo>

The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times, the solution involves designing a product (like a machine or computer code) that meets certain criteria and/or accomplishes a certain task.

This process is different from the Steps of the Scientific Method, which you may be more familiar with.

- ✓ If your project involves making observations and doing experiments, you should probably follow the Scientific Method.
- ✓ If your project involves designing, building, and testing something, you should probably follow the Engineering Design Process. If you still are not sure which process to follow, you should read *Comparing the Engineering Design Process and the Scientific Method* (see the following page).

The steps of the engineering design process are to:

- **Define the Problem** (*What do you want to solve? How could you build a (bridge)?*)
  - **Do Background Research** (*What does it look like? Find examples, photos, etc.*)
  - **Specify Requirements** (*What materials do I need? How much space? time?*)
  - **Brainstorm Solutions** (*What are the possible ways to build this?*)
  - **Choose the Best Solution** (*This solution will work best for my circumstances.*)
  - **Do Development Work** (*Start exploring the materials and decide which will work best.*)
  - **Build a Prototype** (*Create the building or structure.*)
  - **Test and Redesign** (*Does it stand up? Will it hold a car, etc.? Can a car go through the bridge? Do I need to redesign it to make it sturdier? or wider? or taller? or?*)
- (\*clarifying statements added to original document)



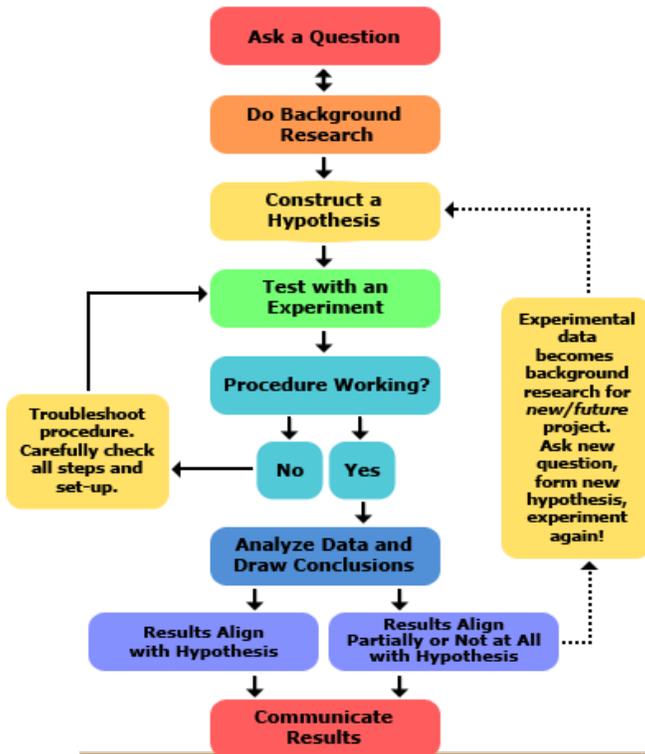
Engineers ***do not always*** follow the engineering design process steps in order, one after another. It is very common to design something, test it, find a problem, and then go back to an earlier step to make a modification or change to your design. This way of working is called **iteration**, and it is likely that your process will do the same!

**This information is from the Science Buddies website:**

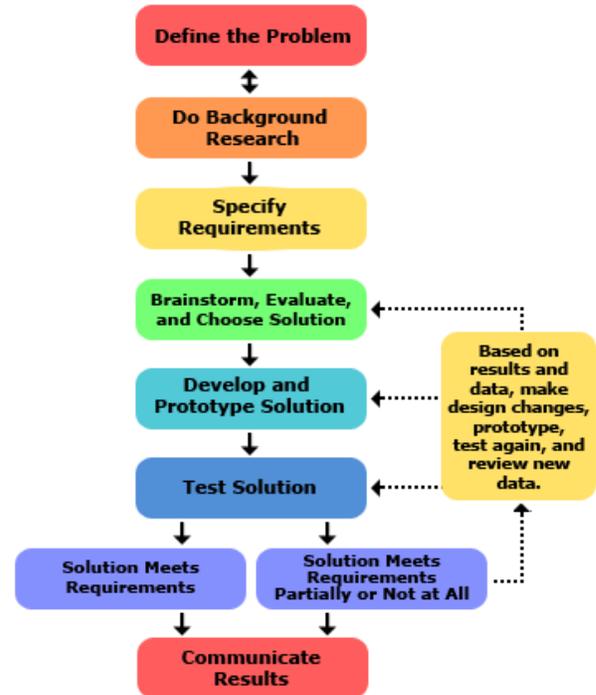
<https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps#keyinfo>

# Engineering for Preschoolers!

## Scientific Method



## Engineering Method



The Scientific Method	The Engineering Design Process
State your question	Define the problem
Do background research	Do background research
Formulate your hypothesis, identify variables	Specify requirements
Design experiment, establish procedure	Create alternative solutions, choose the best one and develop it
Test your hypothesis by doing an experiment	Build a prototype
Analyze your results and draw conclusions	Test and redesign as necessary
Communicate results	Communicate results
<a href="#"><u>Steps of The Scientific Method</u></a>	<a href="#"><u>Steps of The Engineering Design Process</u></a>

This information is from the Science Buddies website: <https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps#keyinfo>