Engineering (S.T.E.A.M.)

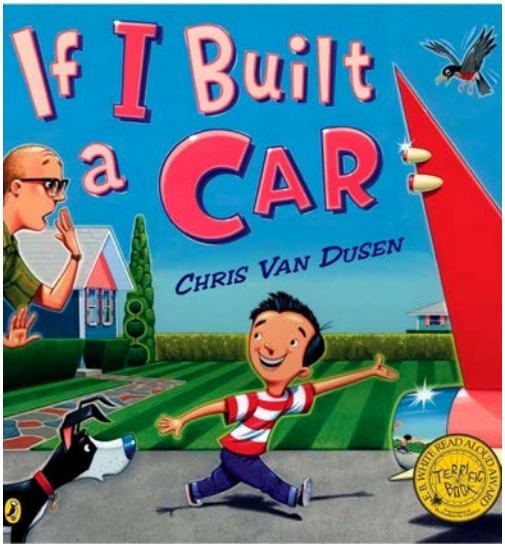
We Skoolhouse

Engineering

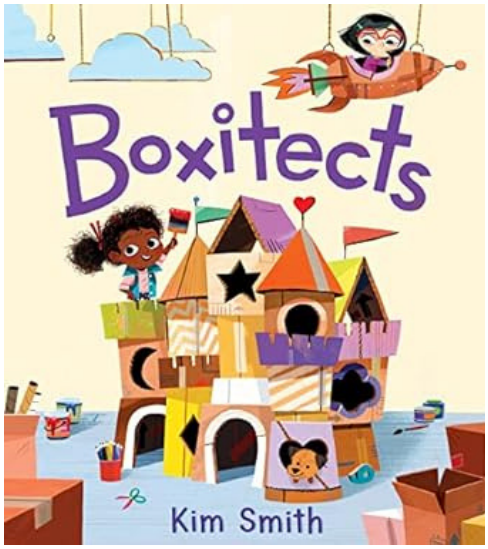
Exploring engineering empowers children to become creative problem solvers and innovators. Through activities such as building structures, designing solutions to real-world challenges, and experimenting with mechanisms, children develop spatial reasoning, teamwork skills, and perseverance, preparing them to tackle complex problems in various fields.

Books We Love That Support Engineering Concepts:

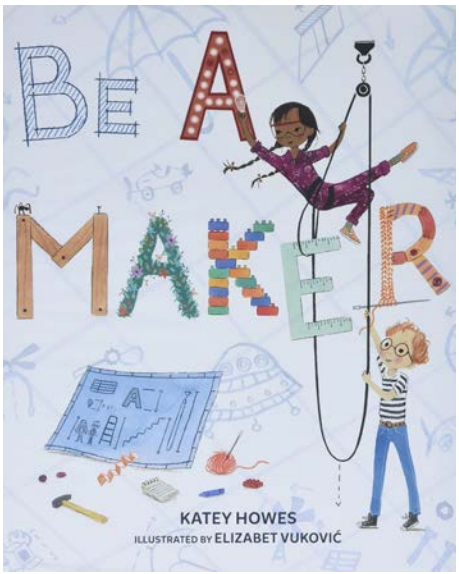
The Most Magnificent Thing
by Ashley Spires



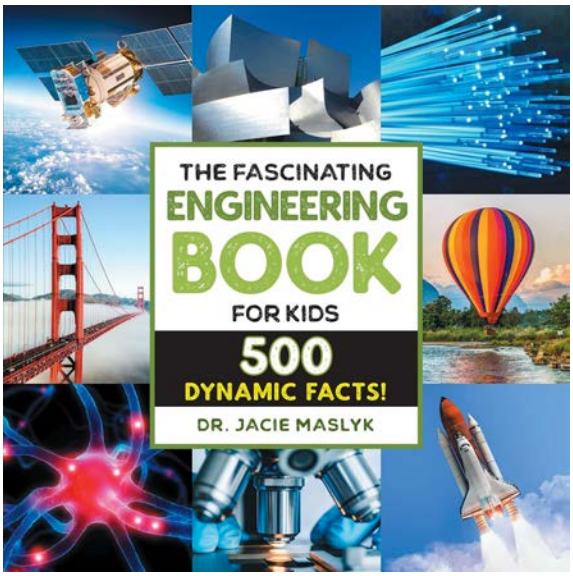
If I Built A Car
by Chris Van Dusen



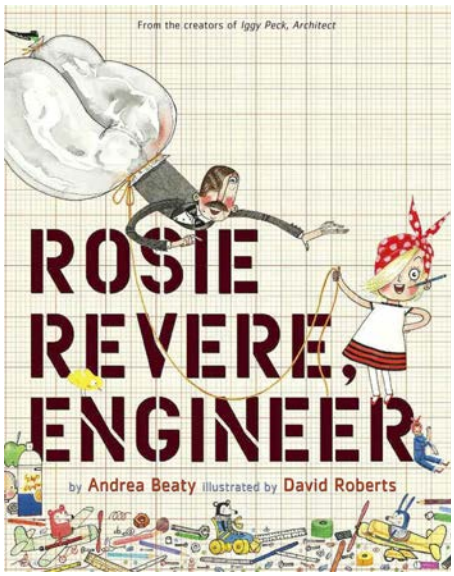
Boxitects
by Kim Smith



Be A Maker,
by Katy Howes



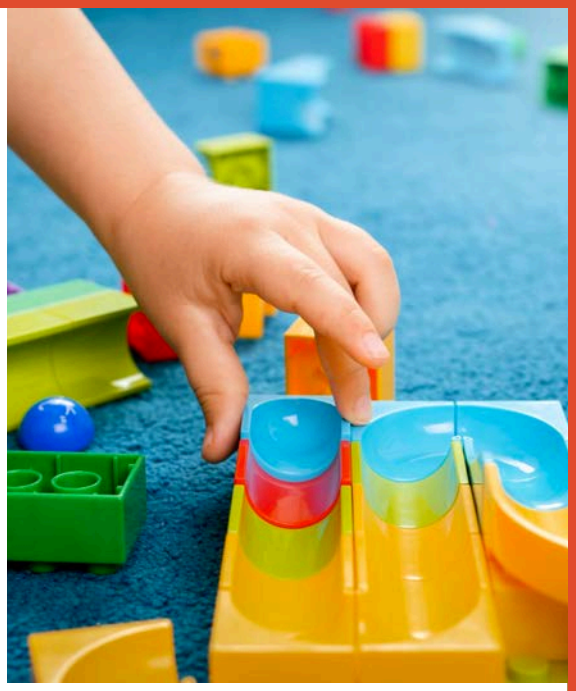
The Fascinating Engineering Book For Kids,
by Dr. Jacie Maslyk

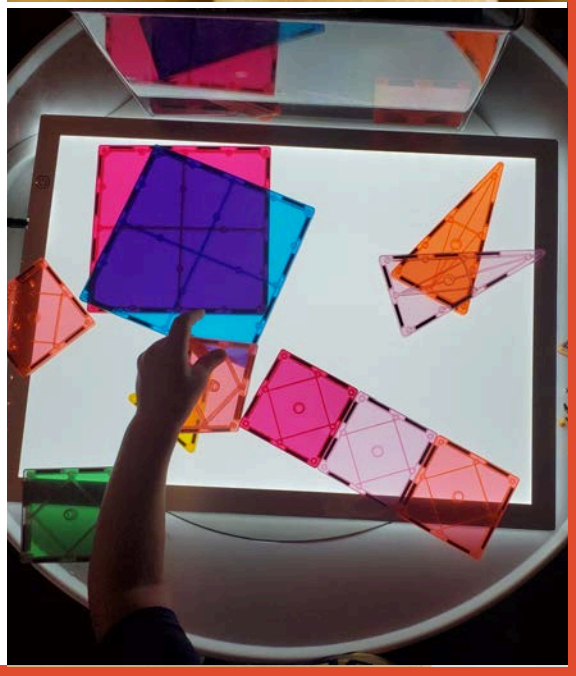


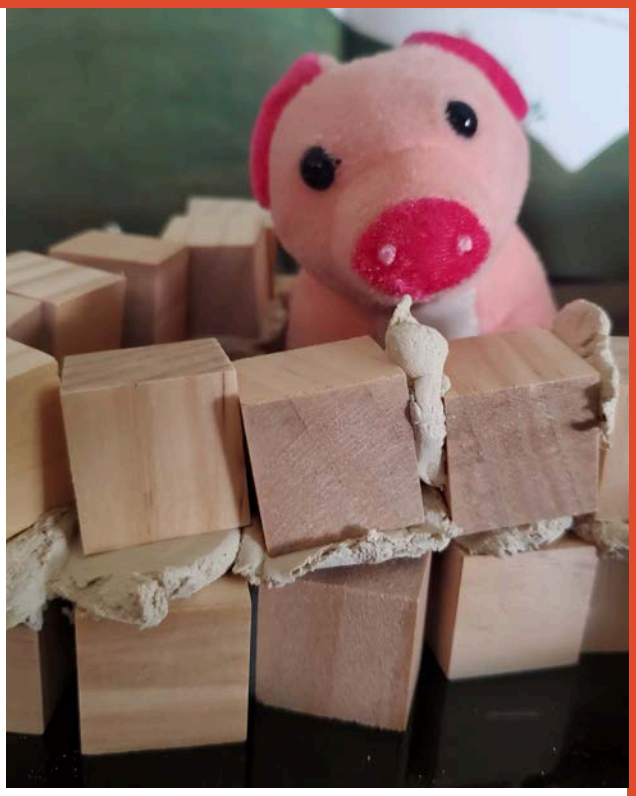
Rosie Revere, Engineer,
by Andrea Beaty

20 Materials to Support Engineering Exploration

1. Wooden blocks
2. LEGO sets
3. K'NEX building sets
4. Tinkering kits (loose parts)
5. Marble runs or roller coaster sets
6. Gears and pulleys sets
7. Magna-Tiles or similar magnetic building sets
8. Pipe cleaners and bendable straws
9. Craft sticks and glue
10. Cardboard tubes and boxes
11. Rubber bands and rubber tubing
12. Popsicle sticks
13. Straw connectors
14. Foam shapes and connectors
15. Building bricks (e.g., Mega Bloks)
16. Recycled materials (e.g., bottle caps, cardboard)
17. Wooden dowels and connectors
18. Elastic bands and bungee cords
19. Ramps and tubing
20. Gear and chain sets







Constructing Homes For The Three Little Pigs

MATERIALS

- Three plush pigs (representing the three little pigs)
- Wooden cubes or blocks
- Raffia or straw-like material
- Twigs or small sticks
- Modeling clay or playdough
- Optional: small toy wolf figurine
- Optional: Three Little Pigs book

DIRECTIONS

- Begin by introducing the story of "The Three Little Pigs," either through reading the book or telling the story orally. Discuss the characters, setting, and plot elements.
- Set up a designated play area or table where children can engage in hands-on exploration and storytelling with the materials provided.
- Place the three plush pigs, wooden cubes, raffia/straw, twigs, and modeling clay/playdough on the table, making them easily accessible.
- Allow children to explore the materials freely and express themselves through imaginative play. Offer support and guidance as needed, but allow children to take the lead in directing their play and storytelling.

LEARNING OBJECTIVES

- **Introduction to Basic Engineering Principles:** Children will gain an introductory understanding of engineering concepts such as structure, stability, and design as they build houses for the pigs and experiment with different construction techniques.
- **Story Retelling:** Children will practice recalling and recounting the narrative of "The Three Little Pigs," enhancing their comprehension and verbal communication skills.
- **Creativity and Imagination:** Children will engage in imaginative play as they explore different ways to represent characters, settings, and events from the story using the provided materials.
- **Fine Motor Skills:** Children will develop dexterity and control in their hands and fingers as they manipulate and assemble the various objects, promoting hand-eye coordination and precision.

DIY Skee Ball

MATERIALS

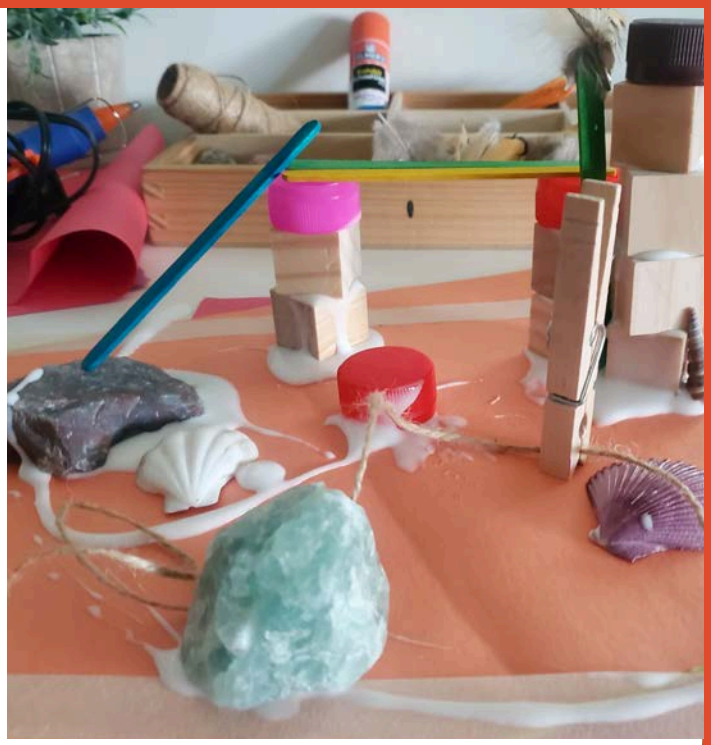
- Magna Tiles
- 1 pack of plastic balls
- Basket or bowl to hold the balls
- Optional:
  - Small boxes (to act as steps if there are no accessible steps)
  - Paper, marker, & tape (to create a point system for the game)

DIRECTIONS

- On an open stairway, welcome children to create small enclosures to "catch" the balls.
- The number of enclosures will vary based upon the amount of magna tiles you have.
- Alternative: if you do not have stairs accessible, you can utilize small boxes to elevate the ball enclosures or simply place them on the floor, but have children stand back to provide a challenge.
- At the bottom of the steps, have a handful of balls accessible for children to throw.
- Optional: To add math concepts, you can create a point system for each enclosure. Perhaps a large enclosure that is closer to the bottom is worth 1 point, while a small enclosure higher up is worth 3 points.

LEARNING OBJECTIVES

- Concepts of **mathematics and engineering are embraced** as your child utilizes open-ended materials to innovate and create enclosures for the DIY Skee Ball game.
- **Concepts of size and spatial awareness are needed** to know how big to make each enclosure, while a point system supports basic addition & more than/less than concepts.
- Your **child will practice hand eye coordination, while expanding visual perception, and motor strength and control** (fine and gross) as they aim & throw.
- **Following rules/order of a game, cooperation, turn-taking, and social emotional resilience** of winning and losing are all exercised.



Maker's Station

MATERIALS

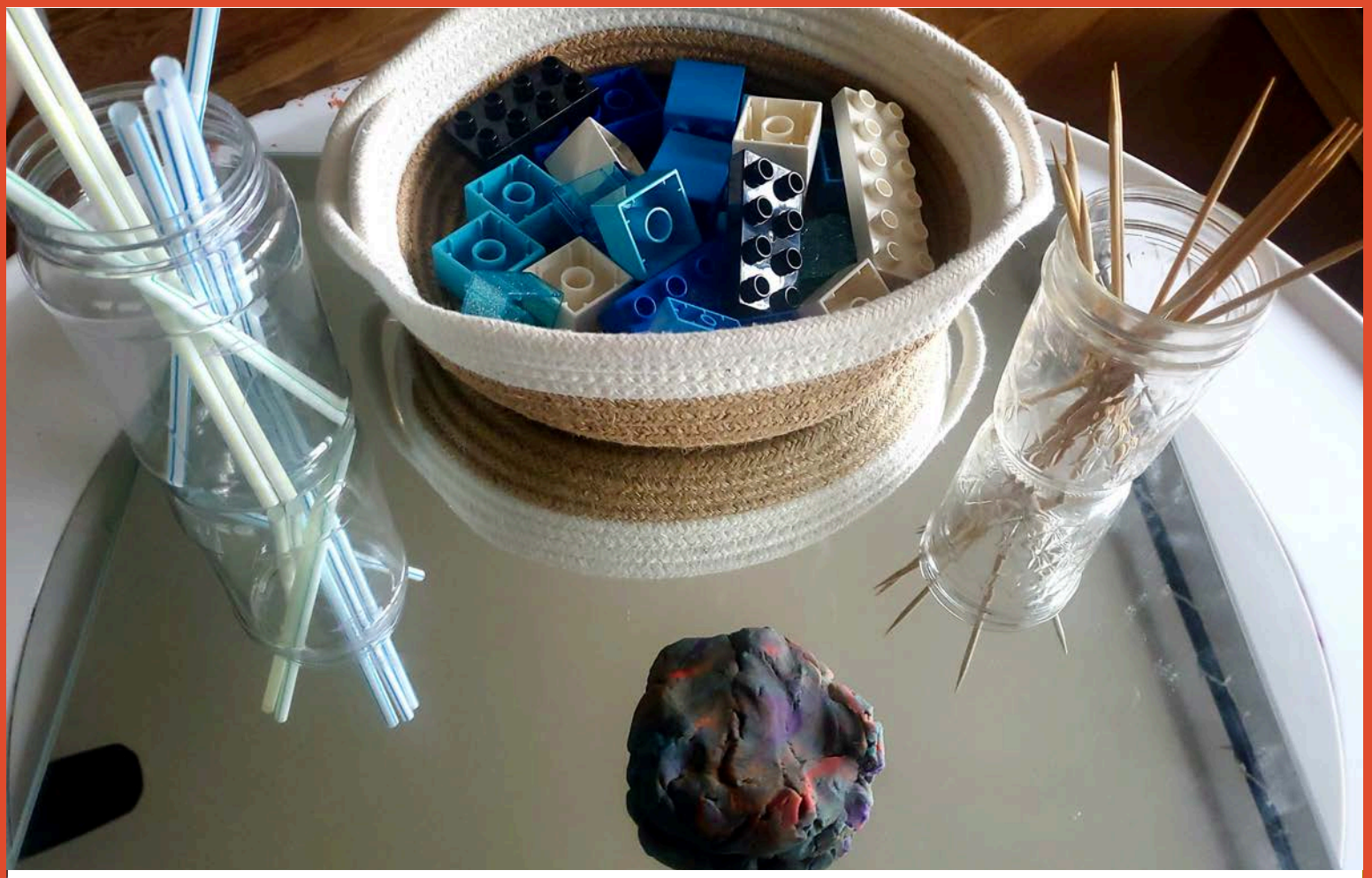
- Assortment of "sticky stuff." Consider: glue, glue-sticks, glue gun (with supervision), tape, staple gun, clothespins, sticky notes.
- Assortment of loose parts and open-ended materials. Consider popsicle sticks, pom-poms, caps, rocks, feathers, string, beads.
- Optional: scissors and coloring utensils

DIRECTIONS

- Set up the Station: Designate a dedicated space for the "Makers Station," such as a table or a designated corner.
- Place the sticky mediums and loose parts in separate containers/trays for easy access.
- Invite children to freely explore the sticky mediums and loose parts, encouraging them to experiment with different arrangements, allowing their creativity to flow.
- Ideally this station can exist for an extended period of time in which your child can edit and add to their work. Consider replenishing or changing materials as children go.

LEARNING OBJECTIVES

- Through trial and error, **children encounter various engineering challenges,** such as figuring out how to connect different parts, create stable structures, or solve design constraints. They **learn to think critically and creatively to overcome these challenges.**
- **Encourages an iterative approach to engineering,** where children continuously build upon their previous creations. **They experiment, evaluate, and make improvements** to their designs over time, developing a deeper understanding of the engineering process.
- Your child will gain insight into the strengths, limitations, and characteristics of various substances. **They learn about the structural properties of different materials** and how they can be used to create stable and functional designs.



Building with Legos, Clay, and Sticks

MATERIALS

- Approximately 10 Duplo Legos
  - If using the classic, smaller legos, double the number to 20
- Straws and/or long toothpicks
- Clay or play dough
- Optional: Acrylic Mirror

DIRECTIONS

- Present legos, straws, toothpicks, and play dough on the table for children to explore.
- Children may approach this experience in different ways, e.g. mark making, stacking, poking, etc. and that's perfectly fine. Letting them explore the properties on their own first will allow them to build mastery of each material, in which they will eventually combine these materials and explore them in new and innovative ways.

LEARNING OBJECTIVES

- Children can experiment with building structures using play dough as a base and loose parts as supports or reinforcements. This hands-on exploration helps them **understand how different materials can be combined to create stable and sturdy structures.**
- **Engineering often involves identifying and solving problems.** When working with play dough and loose parts, children encounter challenges such as balancing structures, connecting components, or achieving desired outcomes. They **learn to approach these challenges systematically, experimenting with different solutions and adjusting their designs based on observations and feedback.**

Monochrome Construction

MATERIALS

- One large basket or bin
- Various open-ended materials & building blocks that are the same color. E.g.: Blue legos, blue magna tiles, blue caps/lids/bottles, blue cups bristle blocks, blue popsicle sticks/pipe-cleaners

DIRECTIONS

- Invite children to help collect materials that share the same color and add them to the basket.
- Once the basket is filled, place the basket down in a clear and open space so children have ample and comfortable room to explore and play.
- Let children combine and play with the materials in their own way to see what they discover and do!

LEARNING OBJECTIVES

- **Flexible Thinking:** Children will engage in flexible thinking as they creatively combine materials of the same color, even if they are different types of toys. This activity encourages them to think beyond the intended use of each toy and explore new ways to play and create.
- **Problem-Solving Skills:** Children will practice problem-solving skills as they encounter challenges and obstacles while combining materials. They will experiment with different arrangements and configurations to find ways to connect and integrate the toys effectively.
- **Visual Discrimination:** Children will refine their visual discrimination skills as they compare and match materials based on their color similarities, strengthening their ability to perceive subtle differences in hues and shades.
- **Creative Expression:** Children will express their creativity and imagination as they experiment with different ways to combine and use the materials. They will invent stories, build imaginative worlds, and explore open-ended play possibilities, fostering a sense of curiosity and wonder.

Can You Make a Woodland Home?

MATERIALS

- Natural materials: (sticks, shredded paper, wood slices, rocks, pinecones, leaves, etc.)
- Air-dry clay or modeling clay
- Toy woodland-themed animals
- Optional:
  - Additional materials for embellishments (fabric scraps, feathers, moss, etc.)
  - Book: A Home Can Be... by Stephanie Seidler

DIRECTIONS

- Provide a variety of natural materials such as sticks, shredded paper, wood slices, rocks, pinecones, and leaves, as well as air-dry clay for building structures.
  - You can use visual representation to inspire!
- Invite children to use their creativity and engineering skills to design and construct woodland homes for the toy animals. Encourage them to think about the specific needs and preferences of different animals when designing their homes.
- When completed, invite children to share and discuss their creations, explaining their design choices and engineering solutions.
- Display the woodland homes in a designated are allowing children to interact with and play imaginatively with their creations.

LEARNING OBJECTIVES

- **Engages in engineering design processes** as they plan, construct, and refine woodland homes, considering factors such as stability, durability, and functionality.
- **Develops problem-solving skills** as they encounter challenges and obstacles during the construction process, such as balancing materials or securing structures, and explore creative solutions to overcome them.
- **Exercise their creativity and innovation** as they imagine and design unique woodland homes for the toy animals, incorporating imaginative elements and personal touches in their constructions.