

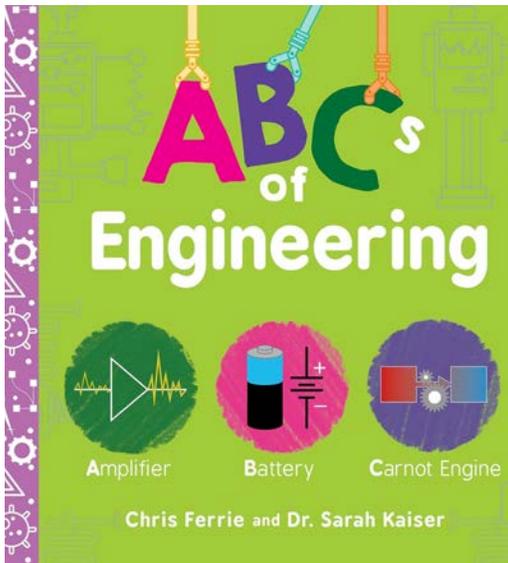
Engineering (S.T.E.A.M.)



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.

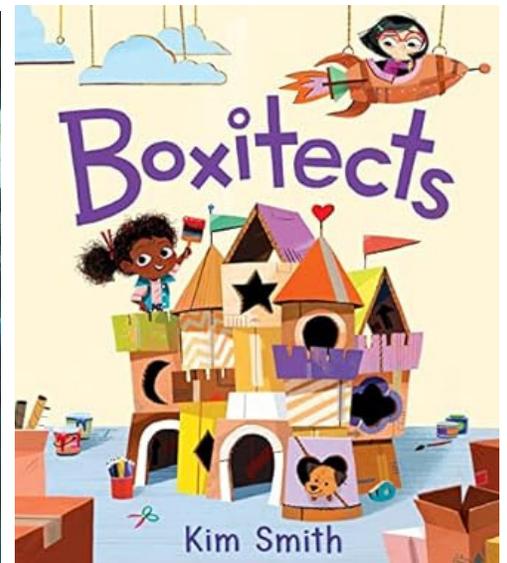
Books We Love That Support Engineering Concepts:



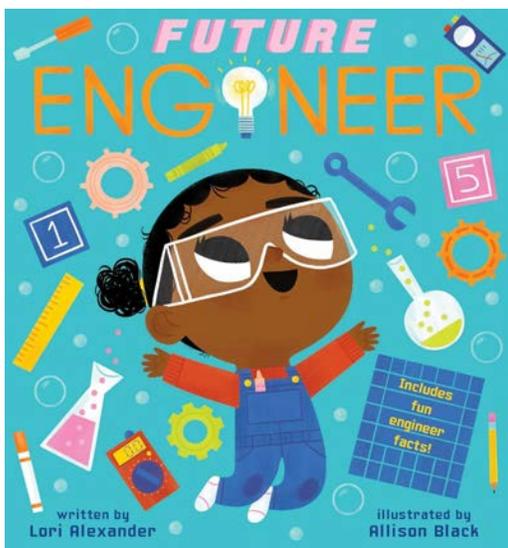
ABC of Engineering
by Chris Ferrie



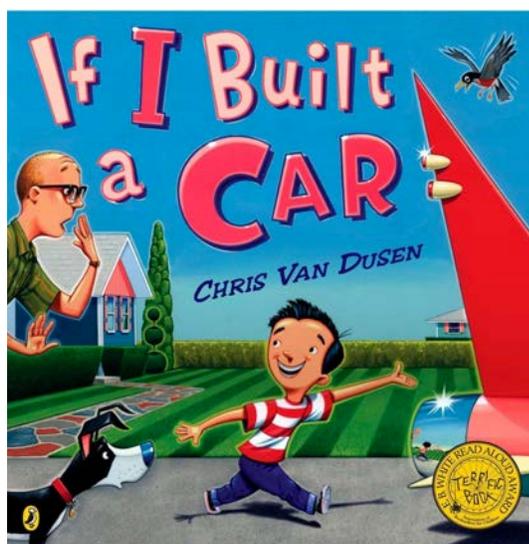
A Home Can Be...
by Stephanie Seidler



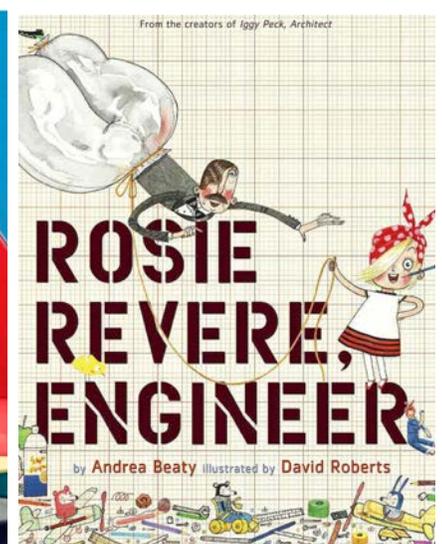
Boxitects
by Kim Smith



Future Engineer
by Lori Alexander



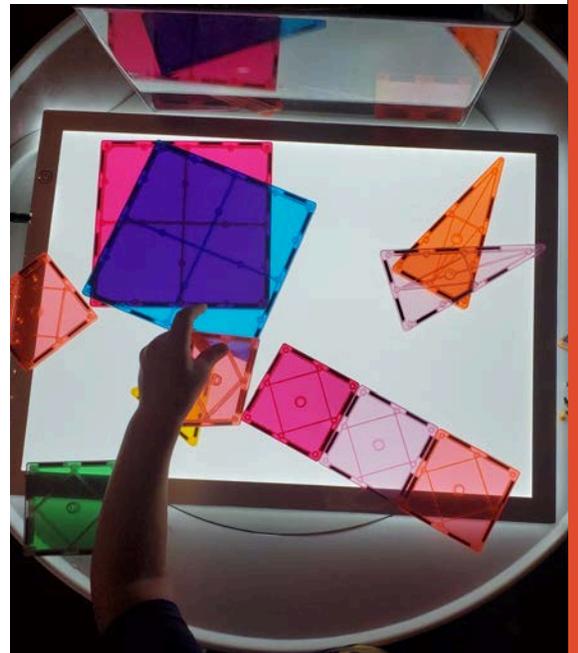
If I Built a Car
by Chris Van Dusen

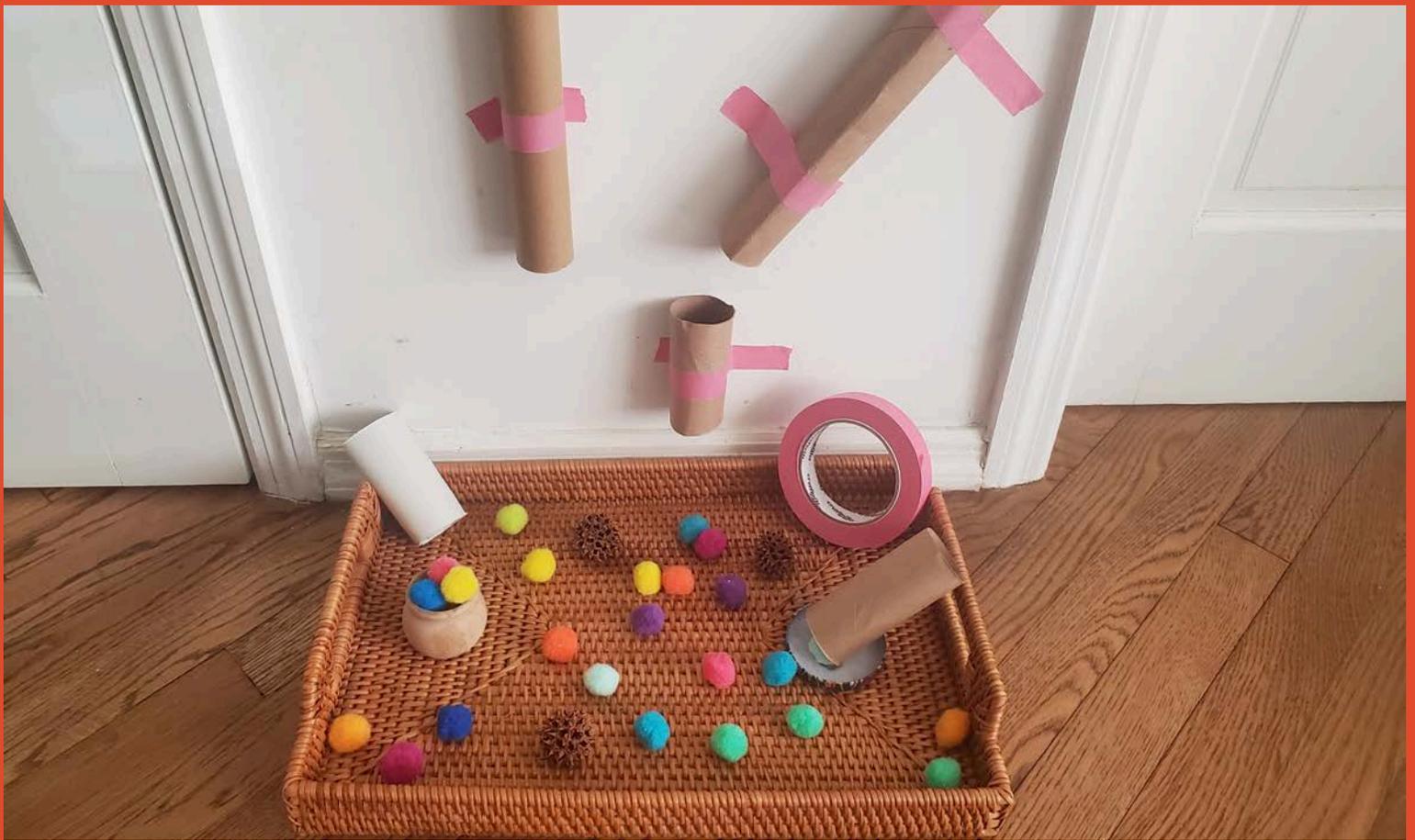


Rosie Revere, Engineer
by Andrea Beaty

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





Pom-Pom Chutes

MATERIALS

- Empty toilet paper or paper towel rolls (various sizes)
- Masking tape or painter's tape
- Pom-poms (various colors and sizes)

DIRECTIONS

- Tape the empty toilet paper or paper towel rolls securely onto the walls at different heights and angles. Ensure that the rolls are stable and won't fall off when pom-poms are dropped into them.
- Place pom-poms near the chutes so that children can easily access them.
 - You can use pom-poms of various colors, sizes, and textures to add visual interest and sensory stimulation.
- Invite children to explore the chutes from different angles and heights to see how it affects the trajectory of the pom-poms.

LEARNING OBJECTIVES

- **Introduce Engineering Concepts:** Through hands-on exploration with the pom-pom chutes, children are introduced to basic engineering concepts such as gravity, motion, and structural stability. They learn how to design and manipulate the chutes to achieve desired outcomes, fostering an early understanding of engineering principles.
- **Explore Cause and Effect:** By experimenting with the chutes and observing how different actions lead to different outcomes, children learn about cause and effect relationships.
- **Develop Fine Motor Skills:** Dropping pom-poms into the chutes and watching them roll out helps children refine their fine motor skills and hand-eye coordination.



Building with Legos

MATERIALS

- Duplo LEGO blocks of various sizes and colors
 - Alternative: Unit blocks, bristle blocks, magna-tiles, foam blocks, etc.
- Open space for building

DIRECTIONS

- Provide children with a selection of Duplo LEGO blocks in a variety of sizes and colors.
- Encourage children to explore the blocks, feeling their shape, size, and texture.
- Try to avoid labeling or expecting children to make something concrete and recognizable. Focus more on the process of exploration, experimentation, and discovery.

LEARNING OBJECTIVES

- **Engineering Concepts:** Duplo LEGO exploration introduces children to basic engineering principles such as stability, structure, and balance, laying the foundation for future STEM learning. Children will begin to understand how different shapes and sizes of blocks can be combined to create stable and functional structures.
- **Spatial Awareness:** Through building with Duplo blocks, children will gain an understanding of spatial relationships, learning concepts such as balance, stability, and symmetry.
- **Problem-Solving:** Children will engage in problem-solving as they experiment with different configurations of Duplo blocks to create stable structures.
- **Creativity and Imagination:** Building with Duplo blocks encourages children to use their imagination and creativity to construct unique structures and designs.



Routing Waterways

MATERIALS

- Plastic containers of various sizes and shapes (e.g., cups, bowls, funnels)
- Water table or large shallow container
- Toy boats, cars, or other floating objects
- Small plastic tubing or PVC pipes (optional)

DIRECTIONS

- Set up the water play area, whether it's a water table or a large shallow container filled with water.
- Provide children with a variety of plastic containers, toy boats, cars, and other floating objects to play with in the water.
- Encourage children to explore pouring, scooping, and transferring water using the plastic containers.
- Introduce simple water experiments, such as observing which objects float or sink, or creating water pathways with plastic tubing or PVC pipes (if available).
- Allow children to freely explore and experiment with the water play materials, providing guidance and support as needed.

LEARNING OBJECTIVES

- **Engineering Concepts:** Water play introduces children to basic engineering concepts such as buoyancy, flow, and fluid dynamics. Children will begin to understand how objects interact with water and how simple systems can be manipulated to achieve different outcomes.
- **Sensory Exploration:** Water play provides sensory stimulation, allowing children to explore the properties of water through touch, sight, and sound.
- **Problem-Solving:** Water play encourages problem-solving as children experiment with cause and effect relationships, such as discovering how to make objects float or creating water pathways with tubing.



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.**



Ramp Exploration (Simple Machines)

MATERIALS

- Ramps of varying sizes and shapes (e.g., wooden planks, cardboard tubes, foam pool noodles, blocks)
- Lightweight objects for rolling (e.g., small balls, toy cars, wooden blocks)
- Optional: Tape or adhesive putty (for securing ramps)
- Flat surface (such as a table or the floor)

DIRECTIONS

- Set up a flat surface where children can explore and experiment with ramps. You can use a table, the floor, or any other stable surface.
- Place the ramps on the surface, positioning them at different angles and orientations to create interesting pathways for objects to roll down.
- Invite children to select objects for rolling down the ramps. Encourage them to choose different shapes and sizes of objects to observe how they interact with the ramps.

LEARNING OBJECTIVES

- **Fosters Scientific Inquiry:** Children engage in hands-on exploration and observation, fostering a curiosity for scientific concepts related to motion, gravity, and friction.
- **Promotes Spatial Awareness:** Children develop spatial awareness and understanding of spatial concepts such as height, length, and angle as they interact with the ramps.
- **Explores Cause and Effect:** Children learn about cause and effect relationships as they observe how changes in ramp angle and object size affect the speed and direction of rolling.
- **Encourages Problem-Solving:** Children engage in critical thinking and problem-solving as they experiment with adjusting ramp configurations to achieve desired outcomes.



Colorful Construction

MATERIALS

- Various toys and materials that vary in color
 - Consider lego pieces, magna tiles, colored blocks, tape, sponges, etc.
- Optional: Tray or container to hold materials

DIRECTIONS

- Gather a handful of materials that vary in color and wouldn't typically go together (e.g. legos and magna tiles).
- Provide children with these materials to explore and play with and see what they do.
- Please note, children are not meant to make anything specific, but explore, experiment, and discover!

LEARNING OBJECTIVES

- **Develops Engineering Skills:** Tinkering with different materials and observing their interactions, children develop foundational engineering skills such as spatial reasoning, structural stability, and material science concepts. Through trial and error, children learn to assess the properties of each material, such as strength, flexibility, texture, and weight, and consider how these properties can be leveraged in their designs.
- **Promotes Flexible Thinking:** When introducing diverse materials, children are prompted to think flexibly and creatively about how they can use these materials in novel ways. This fosters a growth mindset and encourages children to experiment, innovate, and problem-solve as they adapt to new challenges and constraints.