

Using Children’s Books to Support Engineering Education in K-5 Classrooms (Resource Exchange)

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Grade level: K-5 **Time:** Three multi-day lesson sequences **Standards:** NGSS K-2 and 3-5 standards are addressed, see full lesson plans for specific standards.

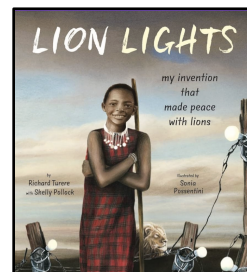
Children's picture books offer an engaging and accessible entry point for introducing engineering in elementary classrooms. This resource exchange shares a curated K-5 book list, a teacher friendly rubric, and three classroom-ready lesson sequences aligned to the engineering design process (EDP), engineering habits of mind, and engineering career exposure. Through purposeful read-alouds and hands-on design challenges, teachers can help their students learn to think and act like engineers while supporting literacy, NGSS, and social-emotional goals. The selected titles come from the 2017-2025 NSTA Best STEM Book lists and were analyzed using an identity in practice framework, which examines how engineering identity develops through participation and exposure to engineering practices. Educators are not expected to implement all lessons or all aspects of the lessons. They can choose one of the three themes: EDP, Habits of Mind, or Career Exposure, and select the lessons that fit their classroom goals, time, and comfort level. An accompanying 2026 fundamental PCEE paper, written by the same authors, provides a deeper examination of the methods and criteria used to select and analyze the featured picture books.

Lesson 1: Engineering Design Process

Lion Lights: written by Richard Turere and Shelly Pollock, illustrated by Sonia Possentini, Published by Tilbury House Publishers, 2022

Grade Band: K-5 **Time:** Four class periods to allow time for students to define problems, prototype, test, and revise.

Essential Question: *How can we design a solution that keeps wild animals and people safe without causing harm?*



Day 1: Introduce the Problem: Discuss human-animal conflicts and why engineers design solutions that protect both people and animals. Use real-world examples (ex: roads near wildlife, farms near animal habitats, hiking trails near bear habitats). Create a class chart with a class idea that lists where the problem occurs, what the conflict is, possible criteria (what the solution must do), and constraints (limits on materials, cost, or safety). **Read & Identify EDP:** Go over the EDP and reinforce vocabulary. Read *Lion Lights* and identify moments that show the steps in the EDP: Ask, Imagine, Plan, and Improve.

Day 2: Plan & Build: In small groups, students choose one idea from the class chart and then plan and build a model solution to the problem. Require each group to sketch, label, and then build their model. Encourage students to mirror the character in the story as they create their solution.

Day 3: Test & Improve: Students revise designs based on testing and other groups' feedback. They should draw at least one improvement made to their design on a worksheet. Discuss productive failure and trial and error as expected and important parts of engineering work.

Day 4: Finish up Projects & Share & Reflect: Groups do a gallery walk and see their classmates' models. Groups explain their solution and one improvement made after testing during the gallery walk. Reflection prompts could include: What problem did you define? What criteria helped you in making your design? What changed after testing?

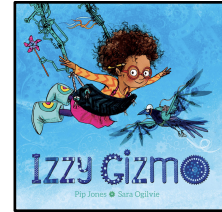
Materials: recyclable materials, tape, paper, string, markers, LEDs or paper symbols that represent light

Assessment: During Share & Reflect, students will be able to see their classmates' designs and thought processes and how they followed the steps of the EDP within their groups by looking at their worksheets.

Lesson 2: Engineering Habits of Mind

Izzy Gizmo: written by Pip Jones, illustrated by Sara Ogilvie
Published by Simon & Schuster Children's UK, 2019

Grade Band: K-2 **Time:** Four class periods to allow time for revision and reflection.



Essential Question: *How can we design a solution to help someone we care about?*

Day 1: Mindset Warm-Up: Discuss how we feel when ideas fail and what we can do about it. **Read & Discuss Habits of Mind:** Read Izzy Gizmo and identify times where she shows perseverance, creativity, curiosity, and optimism. Create a class anchor chart linking each engineering habit of mind to a moment in the story.

Day 2: Plan & Build: Students design and build a first prototype of their ideas.

Day 3: Test & Redesign: Students change at least one part of their design after meeting with the teacher. Emphasize that revision shows growth and is something real engineers do.

Day 4: Share & Reflect: Students (using a worksheet provided in the lesson plan) finish sentence stems to share one habit of mind they used, when they used it, and what they did during the making of their design. You can add sentence stems like "When my design did not work, I _____ and improved my idea by _____."

Materials: craft supplies, recyclables, tape, string, stuffed animals (optional)

Assessment: Students self-reflect and explain which habit of mind they exhibited the most during the activity, focusing on how they responded to challenges or failure.

Lesson 3: Engineering Career Exposure

Blast Off! How Mary Sherman Morgan Fueled America into Space:
written by Suzanne Slade, illustrated by Sally Wern Comport
Published by Calkins Creek, 2022

Grade Band: K-5 **Time:** Four class periods to allow for testing, data collection, and redesign.



Essential Question: *How can we design and improve a rocket using simple materials, like real engineers do? How do engineers test, improve, and communicate ideas in real world careers?*

Day 1: Career Introduction: Discuss various engineering careers and how teamwork supports their work. Introduce aerospace and mechanical engineers using video clips. Highlight collaboration & communication, persistence, and lifelong learning as essential career skills. **Read & Discuss Engineering Work:** Read Blast Off! and identify how engineers test, fail, and improve designs.

Day 2: Plan & Build: Students plan, design, and build paper rockets using simple materials. Students define success criteria like height or stability and identify one constraint before testing.

Day 3: Test & Improve: Students modify designs based on what height they reach. Encourage students to use simple data collection to revise, reinforcing the iterative process of problem solving.

Day 4: Share & Reflect: Students connect their work to engineering careers.

Materials: paper, tape, straws, string, balloons, rubber bands

Assessment: Students should talk about their testing and improvement process while incorporating the careers connected to their work, making connections between classroom design work and professional engineering practices.

These resources combined offer flexible entry points for integrating engineering into everyday instruction in meaningful and engaging ways.

Link to full recommended K-5 engineering book list: [Full Recommended K-5 Engineering Book List](#)

Link to Full Lesson Plans with NGSS Standards: [Resource Exchange: 3 Engineering Lesson Plans](#)

Link to Teacher Rubric to select additional engineering books: [Education Rubric.png](#)

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