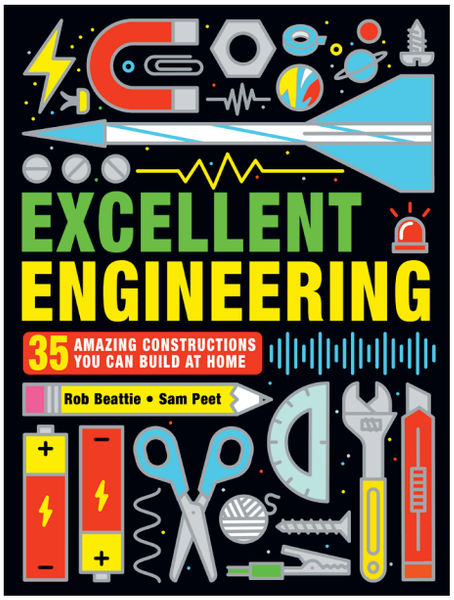


The EXCELLENT ENGINEERING Teacher's Guide

Focus Book

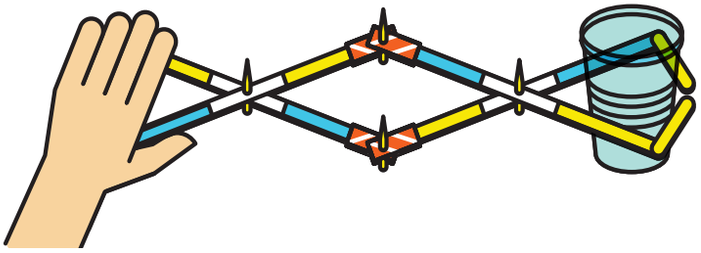
Excellent Engineering: 35 Amazing Constructions You Can Build at Home
by Rob Beattie,
illustrated by Sam Peet
9781786033680
Grades 2-5, Ages 7-11

Essential Questions In This Unit

- How are common household objects and science connected?
- What is basic engineering all about?
- What are the 3 different types of engineering categories from the book?
- What are the parts of a successful engineering project?
- What is the science behind these individual experiments?
- How can these experiments be applied in real life?

Learning Objective

With these 35 fun and achievable experiments, kids can create step-by-step engineering projects using everyday objects they find around the house or classroom. By challenging them to test their science and engineering skills, students will think about different types of engineering, the components of a successful project, how these projects may reflect larger situations around them, and how scientific thinking can turn everyday objects into something useful.



Classroom Discussion Topics

1. Ask students to pick a selection of 5-7 of the 35 excellent engineering projects included in the book—what common problems do they solve (if any), or are they just for fun? Their selection could be of their own choosing or broken into pre-selected categories, including engineering type, materials used, or difficulty.

2. Define "electrical engineering" with students. In the real world, where can large or small scale electrical engineering be seen in action? How do everyday objects like cell phones incorporate electrical engineering? What other types of engineering are everyday electrically-engineered projects comprised of?

3. Discuss the the Home-Made Nightlight (p. 30-31) project. How does electricity conduct—through which scientific concepts do the battery and wires work?

4. Discuss the concept and business of mechanical engineering. What examples of mechanical engineering do students see in the everyday world? Choose some notable mechanical engineering landmarks. What problems likely arose in building them when they were first constructed?

5. What are some common problems that mechanical engineering solves? Challenge students to research and describe future mechanical engineering projects they can find in the news; what social or economic factors will these inventions solve/why are they being invented? Can students think of a machine that hasn't been invented yet, but that they'd like to see?

6. How does structural engineering relate to objects in our outside world, such as buildings or bridges? What are examples of famous structural engineering marvels?

7. Discuss the definition of "engineering criteria." When going through test projects, ask students to think through what hurdles they would have to overcome. What research do students need to do in order to develop project criteria?

8. Along with criteria, talk about the concept of engineering constraints. What immediate constraints might students find when approaching these projects? How would they solve them?

9. For the 3 engineering categories—structural, mechanical, and electrical—ask students to describe what would happen if they didn't include a crucial element in the project. Have them discuss why it wouldn't work and the reasoning behind why the element is important to the project.

Student Activities

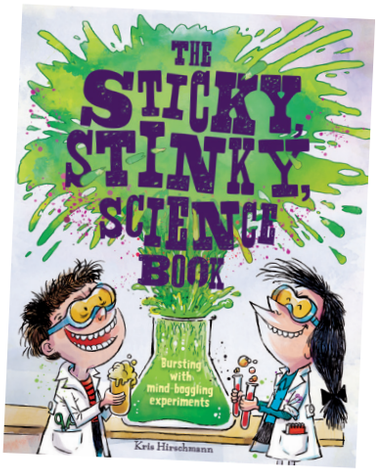
Student Activities

1. Ask students to choose an activity from the book to create in class and then deliver a visual presentation on it using whatever method they choose. Challenge them to talk about why they chose the activity, what problems they had, and how they fixed them. Does their project solve any everyday problems, or is it just for fun? Did they experiment using the "Take It Further" suggestions? Remind them to look at the "Inside the Engineering" explanations for each project or use the terms in the glossary (pp94-95) when giving the presentation.

2. Extend activities beyond the book and ask students to come up with their own engineering creations, either individually or in groups. Ask them to think about any problems their creation will solve, then develop criteria and constraints. What issues did they run into? How did they fix any problems? Challenge students to create a visual presentation to give to the class.

3. Dive deep into famous structural engineering landmarks, such as the Empire State Building in New York City or Tower Bridge in London. Take students on a field trip to visit a local landmark, or even take them to an engineering company to discuss how engineers work, how projects land on their desk, and how various projects are implemented.

4. Discuss everyday mechanical or electrical engineering creations that students find at home—such as a vacuum cleaner, toaster, ironing board, umbrella, or bicycle—and ask them to write a research paper on it. Challenge them to answer various questions about it, including: How does it work? What problems does it solve? Why is it engineered that way? Do they think the original inventor encountered any problems, and what might they have been? How long ago was it invented? Could it be improved?



Further Reading

9781682973998 The Sticky, Stinky Science Book

9781592539253 Kitchen Science Lab for Kids

Quarto Kids

QEB