



## EDUCATOR'S GUIDE

# Jesse Steam: Solving Mysteries through Science, Technology, Engineering, Art & Math

Title: *The Mighty Lever Endeavor*

### Series Overview

Ten-year-old Jesse Steam's curiosity about how the world works leads her to one mystery after another as she pedals around town, often with Mr. Stubbs, her tabby cat, keeping her company in the bike basket. Using simple scientific tools and their powers of observation, Jesse and her friends analyze, test hypotheses, and conduct experiments. If the kids get stuck, they know they can count on Professor Peach, a retired college science educator, to step in with a clear explanation.

Each title in the Jesse Steam series focuses on one STEAM subject: Science, Technology, Engineering, Art or Math.

### About This Book

In *The Mighty Lever Endeavor*, Jesse is faced with some tricky tasks.

First, she needs to move a pile of heavy stones from her aunt's garden to the side of her house. Later, she's challenged to remove an iron spike from a wooden plank in order to win a contest. Luckily, Jesse doesn't have to rely solely on her muscles: She learns how to use simple Class 2 (2nd class) levers—a wheelbarrow to move the stones and a crow bar to remove the spike—to make the tasks easier.

This title focuses on **engineering**.

### Next Core Arts Standards Alignments and Activities

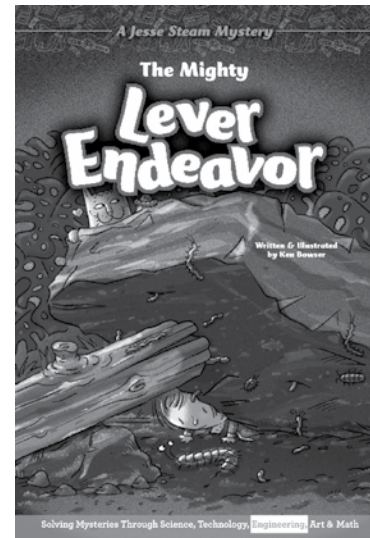
The activities and learning ideas in this guide have been correlated with the **Next Generation Science Standards (NGSS)**:

<https://bit.ly/2kx58A2>

These standards were developed by the National Research Council (NRC) of the National Academy of Sciences. The NRC's Framework for K-12 Science Education combines practices, crosscutting concepts, and disciplinary core ideas to address relevant science, technology, engineering and math (STEM) concepts that students should learn.

For this book, the Engineering Design standard is particularly applicable:

<https://bit.ly/2lzY4mu>.



Lexile: 860 GRL: R 3,408 words



## Background and Key Concepts

*The Might Lever Endeavor* is about using simple machines called levers to help make various tasks, such as lifting heavy loads, easier. A lever is a rod or beam that rests on a support called a fulcrum. There are three types of levers:

- **Class 1, or 1st class, lever:** a lever where the fulcrum is in between the effort and the resistance (load). A seesaw is an example of a Class 1 lever. On a seesaw, the bar in the middle is the fulcrum, the kid on the lower half (the half that's on the ground) is the effort, and the kid on the upper half (the half that's in the air) is the load.
- **Class 2, or 2nd class, lever:** a lever where the resistance is between the effort and the fulcrum. A wheelbarrow is an example of a Class 2 lever. On a wheelbarrow, the fulcrum is the wheel, the effort is the handle that's used to lift the wheelbarrow, and the load is the item or items inside the wheelbarrow.
- **Class 3, or 3rd class, lever:** a lever where the effort is between the resistance and the fulcrum. A fishing rod is an example of a Class 3 lever. On a fishing rod, the end of the rod handle is the fulcrum, the effort is the person's hands, and the load is the fish.

## Class Discussion

Start the discussion by asking students if they've ever heard the word "lever". Explain that a lever is a simple machine that helps make tasks such as lifting heavy loads easier. Write the word and its definition on the board. Then define the word "fulcrum" and write it on the board.

Watch the first video listed under "Videos" below as a class. Once you've watched it, invite students to define each type of lever and to share examples of each type. Allow students to share what types of levers they have used and what those levers helped them to do.

## Student Activity

The Makerspace Activity on page 64 of the book teaches readers how to make and use a Class 2 lever. With the activities below, students will learn how to make and use Class 1 and Class 3 levers. When they are finished with the three activities, they'll have learned how to make all three types of levers!

### Make a Class 1 Lever

A seesaw is an example of a Class 1 lever. In this project, students will make their own seesaw out of two simple objects—a wooden ruler and a pencil. Students will also need small objects, such as little erasers, to use as the load.

1. Have each student place a pencil in the center of their desk with the eraser pointed toward them. Then have them rest the ruler across the pencil (perpendicular to the pencil). They should position the ruler so that the pencil is exactly in the center and the ruler is balancing with both sides in the air. Ask students to name what part of the lever the pencil is (the fulcrum).





Students will note that when the bucket contains more sand, it takes more effort to lift with their hand. But they'll likely be surprised that when the half-full bucket is hanging off the yardstick, it takes more effort to lift than it does to lift the full bucket with just their hand. That's because when you hang the bucket off the yardstick, you increase the length of the output arm, which also increases the amount of input force you need to add.

In all Class 3 levers, the length of the output arm is longer than that of the input arm. When you added length to the student's arm by hanging the bucket on the yardstick, you exaggerated this characteristic. In Class 3 levers, the distance moved by the output load is greater than the distance moved in the input force.

### **Additional Online Resources:**

<https://easyscienceforkids.com/levers/>

<https://eschooltoday.com/science/simple-machines/what-is-a-lever.html>

<https://mocomi.com/lever/>

### **Videos**

#### **Levers for Kids: Types & Examples:**

<https://study.com/academy/lesson/levers-for-kids-types-examples.html>

#### **Super Simple Machines: Levers:**

<https://www.youtube.com/watch?v=lueqEOlxLyc>

#### **Difference Between 1st, 2nd, and 3rd Class Levers:**

<https://www.youtube.com/watch?v=5M98hS8M9hI>