

Understanding Simple Machines – Lever

Standard:

NGSS Standard: 4-PS3-4 Energy:

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

A. GRADE LEVEL: 3rd–5th grade

B. SUBJECT: STEM/Science

C. DATE:

D. DURATION: 2-3 days

E. LESSON FOCUS:

Simple Machines and Mechanical Advantage – Understanding how levers work to lift weights and make work easier.

F. MATERIALS:

- Wooden rulers or flat boards
- Small blocks or weights (such as erasers, small stones, or toy blocks)
- Support objects (like books or wooden blocks)
- Measuring tape or ruler
- Markers or tape for measuring distances
- A notebook or worksheet for recording observations

G. LESSON OBJECTIVES:

- Students will understand the role of simple machines, specifically levers, in making work easier.
- Students will learn how to use a lever to lift a small weight.
- Students will observe and describe how adjusting the position of the fulcrum (pivot point) affects the force needed to lift the weight.

H. PROCEDURES:

1. INTRODUCTION:

- Begin with a short discussion about what simple machines are and how they help us do work.
- Introduce the lever as one of the six simple machines, explaining how it can help us lift heavy objects with less effort. Show pictures of levers in action (e.g., seesaws, crowbars, and scissors).
- Explain that today, students will build their own lever and use it to lift a small weight.

2. EXPERIMENT:

- Provide each student or group with a wooden ruler (lever), small blocks or weights (to act as the load), and support objects (to act as the fulcrum).
- Ask students to place the fulcrum under the middle of the lever and try to lift the weight with their hands. Have them observe how much force is needed to lift the weight.
- Next, have students experiment by moving the fulcrum closer to the weight and farther from it. They should record how the distance between the load and the fulcrum affects the amount of force needed to lift the weight.

3. OBSERVATION:

- Ask students to observe and discuss how adjusting the position of the fulcrum changes the amount of effort required to lift the weight.

- Encourage students to share their observations in their notebooks or on a class whiteboard. Discuss how a lever makes work easier by increasing the mechanical advantage when the fulcrum is closer to the load.

4. GENERALIZATION:

- Summarize how simple machines like levers make work easier by allowing us to use less force to move heavy objects.
- Discuss how engineers use levers and other simple machines to build tools, vehicles, and machines that help us in everyday life.

5. ASSESSMENT:

- Have students complete a worksheet where they label the parts of a lever (fulcrum, load, and effort).
- Ask them to explain in a short paragraph how adjusting the position of the fulcrum changes the force needed to lift the weight.
- Alternatively, students can demonstrate their understanding by creating a simple lever with materials provided and explaining how it works.

Note 1 (Safety Precautions):

Make sure students handle the levers and weights carefully. Remind them to be cautious when adjusting the position of the fulcrum to avoid any injuries. Encourage students to always work with a partner when experimenting with lifting weights.

Note 2 (Accommodation of ELL, ESE, etc.):

For English Language Learners (ELLs), provide visual aids such as pictures of levers in action and simple vocabulary cards to help reinforce key terms (e.g., "lever," "fulcrum," "load," "effort"). Allow extra time for ELL students to express their observations and offer sentence starters or guided questions to support their participation. For students with Exceptional Student Education (ESE) needs, ensure that instructions are clear and concise, using hands-on demonstrations to support understanding.