

Launch It!



Lesson Overview

Students will investigate simple and compound machines.

Suggested Grade Levels: 3-8

Standards for Lesson

Content Standard A: Science as Inquiry

Content Standard B: Physical Science

VA SOL:

3.1 a, b, c; 3.2 a, b, c, d; 4.1 a, b; 5.1 e, f, h;

6.1 a, b, f, g, h, i; LS.1 a, b, e, f, i;

PS.1 a, g, k, l, m; PS.10 d

Time Needed

This lesson can be completed in one class period.

Materials for Lesson

- 1-2 bags of jumbo marshmallows
- Various objects that could be used as a lever such as ruler, plastic spoons, meter stick, paint stick, CD case
- Small buckets or boxes to be used as a target for the marshmallows.

Content Background

Information for teacher:

The simple machine lessens the effort needed to do the same amount of work, making it appear to be easier. The payoff is that we may have to exert less force over a greater distance. There are six basic or simple machines, which alone or in combination make up most of the machines and mechanical devices we use. These simple machines are the lever, the pulley, the wheel and axle, the incline, the wedge, and the screw.

Compound machines are used to make work easier. A compound machine is made up of more than one type of simple machine. Common examples include scissors, shovel, wheelbarrow, pencil sharpener, and can opener. Simple and compound machines help us with our daily lives. Many of them are located at school, at home, and in our means of transportation.

It is difficult to pin point exactly the beginning or discovery of the basic or simple machines that have made possible the construction and building of entire civilizations. By studying the different architectural structures of ancient civilizations we may begin to understand that without basic machines such as the wheel and the axle, or the incline and the lever, civilizations such as the Egyptians, the Romans, and the Greeks could not have built their most admirable architectural landmarks such as the pyramids, the Roman Coliseum, or the many temples that remain from these ancient cultures. They also could not have conducted wars since the catapult made use of some of those simple machines such as the lever, wheel, and the ramp.

The first catapults were constructed by using some of the simple machines such as the lever, wheel, and the ramp. Catapults were invented about 400 BC in the powerful Greek land of Syracuse. At first, catapults were used to shoot spears or stones. The Greeks had much success with this weapon, which urged them to create larger more powerful versions. Later, larger catapults mounted on a single arm were used to hurl stones to attack their enemies.

Although we still know little about the ancient Egyptian technology for handling the huge blocks of stone, there is no evidence they had knowledge of the pulley (Boorstin, 1992). They mainly used sleds, rollers, and levers to move the blocks, and ramps or incline planes to raise the blocks into their place of rest.

Another tool used throughout history in different parts of the world is the plow. The wedge part of the plow makes it possible to separate or break the soil in order to plant crops. The ax and the hoe are other examples of inventions that include wedges.

Among the best known inventors throughout the history of human kind are Archimedes and Leonardo daVinci. Archimedes, a predecessor to Leonardo, was the inventor of the Archimedes' screw, a device used to lift water consisting of a spiral tube wrapped around an inclined rod. *Adapted from the Yale-New Haven Teachers Institute

Engage

Tell students that in this lesson, they will construct a simple machine out of everyday supplies.

Review simple machines. **PAIR DISCUSSION:** Ask students to discuss with their shoulder partners, “How does a bicycle work? What makes it possible for the bike wheel to revolve? What simple machine makes it possible to ride a bike?” (A rod, called an axle, goes through the center hole of the wheel, and the wheel is free to turn around the axle. A wheel and axle is a simple machine that makes it easier to move objects). Follow up with a **CLASS DISCUSSION**

MIX-FREEZE-PAIR: Tell students to stand up and mix around room. After 10-15 seconds, say, “FREEZE!” Students stop in their tracks. Teacher tells students to pair with student closest to them. Ask students: “What simple machines are in the classroom or on the playground?” Give **THINK TIME**. Tell students that they have one minute to **RALLY ROBIN** a list of ways simple machines are used at school. Randomly select students to share answers.

Explore

TEAM PROJECT: Divide the students in groups of 2-4 students. Assign lab roles:

- Principal Investigator who directs others to follow procedures;
- Materials Manager who does experiment;
- Reporter who records data;
- Timekeeper / Cleanup Captain who keeps time and helps clean up.

Have Materials Manager get supplies. Give each group a few jumbo marshmallows and instruct them not to eat them. Provide each group one lever type object such as a paint stick, ruler, plastic spoon, CD case etc, and a small bucket or box to be used as a target for the marshmallows.

Tell each group that their challenge is to come up with a way to launch a marshmallow into their bucket or box. (Boxes or buckets should be placed 3 yards away from the launching point. Have students measure this distance).

Tell the groups that there are two rules they have to follow:

- The marshmallow may only be touching the object before it goes into the air (In other words, you may not touch it with your hand).
- The object must be touching the desk or chair as you launch the marshmallow. (In other words, you may not use your object like a bat to hit the marshmallows).

Provide students about 5 minutes to try different methods of using their tool to launch the marshmallow. Accept any way students select as long as it follows the two rules.

***Most students will choose to use their tool like a lever. Do not use the word lever when talking about it to the students until after the launching challenge.**

Remind students to practice safety precautions when launching their marshmallows by being careful not to hit another student (Students can wear goggles during the activity).

After 5 minutes of practice testing, have each select their best method and try to get 4 out of 4 marshmallows inside the target bucket or box for the official marshmallow launch challenge. Record results on data sheet.

Explain

Have the reporter for each group describe how they used their tool to launch the marshmallow. Remind students to mention what force was needed to make machine work.

Briefly describe (and draw) the main parts of a **lever** on the board for students.

STAND UP, HAND UP, PAIR UP: Students stand and put their hand up. They find a partner who also has a hand up and high five. Ask students if there were any similarities that exist in the way the groups used their tool and the desk or chair to get the marshmallow into the bucket or box and the way a **lever** works. Give THINK TIME. Students **RALLY ROBIN** a list of similarities.

Elaborate

On their science data sheet, students draw a diagram to illustrate their methodology. They explain which simple machine was used and how it helped or hindered them to achieve the goal.

Evaluate

Students write about five ways they use simple machines in their everyday lives.

Students create their own compound machine that will accomplish a simple task.

Extension:

- Allow students to create other tools using items they bring from home. These tools may be compound machines.
- Have students work in teams to locate simple and compound machines around school. Have them interpret the information collected by classifying the machines as simple or compound. For each compound machine, have students name at least two simple machines that make up the compound machine.