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LESSON PLAN

SIMPLE MACHINES

GRADES K-3

SUMMARY

Students will conduct an investigation to see that wheels make moving an object from one place to another easier.
Duration: 30 minutes.



3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Science & Engineering Practices	Connections to Classroom Activity
<p>Planning and Carrying Out Investigations</p> <p>Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <p>With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)</p>	<ul style="list-style-type: none"> Students will conduct an experiment to compare the amount of effort (force) needed to move an object with and without the help of a simple machine.
Disciplinary Core Ideas	Connections to Classroom Activity
<p>PS2.A: Forces and Motion</p> <p>Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)</p>	<ul style="list-style-type: none"> Students will discover that wheels help to move objects.

Crosscutting Concepts

Connections to Classroom Activity

Cause and Effect

Cause and effect relationships are routinely identified.
(3-PS2-1)

- Students will see that using simple machines causes work to be easier.



ENGAGE

Ask students if they ever go shopping in the grocery store. How do you get all your groceries to the cash register? Students should easily come up with “a shopping cart”. Continue by asking: “How does a shopping cart make it easier to get your groceries to the cash register?” Continue prompting until someone mentions that the cart has wheels. Ask what the cart would be like to push if it did not have wheels. Tell students that today they will be experimenting to see how wheels and other “simple machines” make moving things easier.

MATERIALS

- Heavy textbooks
- Variety of things with wheels (wagon, rolling cart, dolly etc.)

DIY Activity

- 14 Large popsicle sticks
- 4 Small rubber bands
- Plastic spoon
- 12 Mini marshmallows



EXPLORE

Students will experiment with moving several textbooks from one side of the classroom in two different ways; one by using their body (they can carry them or push them across the floor), and then again with the help of a tool that has wheels. If available, they can choose from a variety of tools that have wheels and compare the effectiveness.

Introduce relevant vocabulary before doing this activity:

Force - A push or a pull that makes things move.

Push - To move something away from you.

Pull - To move something towards you.

*Safety note: Students must keep ahold of their tool at all times and not let go of them when they push them across the room.



EXPLAIN

Regain the attention of the class and have groups share out loud what they discovered. Prompt with questions, “Which way was easier? Why?” They should conclude that they didn’t have to push as hard. Explain that a wheel and axle are one of six types of simple machines. *Simple machines have few or no moving parts and they make work easier by changing the direction of a force or the amount of force needed to do something.* The one they used today is called the

wheel and axle. The wheel (round part) turns around the axle (the part that goes through the wheel) to make it easier to move things. To learn more about other types of simple machines...



WATCH THE GENERATION GENIUS SIMPLE MACHINES VIDEO AS A GROUP

Then facilitate using the Discussion Questions.



ELABORATE

Discuss with students the other five simple machines.

- **Pulley:** In a pulley, a rope wraps around a wheel. As the wheel rotates, the rope moves too. Pulleys are used to change the direction of a force. You can lift and lower things with the help of a pulley. We use a pulley to raise and lower a flag on a flagpole.
- **Lever:** Any tool that pries something loose is a lever. Levers can also lift objects. A big stick used to help move a rock is a lever. A seesaw is also a lever.
- **Wedge:** A wedge is used to change the direction of a force by pushing things apart. An ax is one example of a wedge, it forces an object apart. A doorstop is also a wedge which pushes up on the bottom of the door as it closes.
- **Inclined Plane:** A flat surface that is slanted. A good example is a ramp next to stairs, it is usually much longer than the stairs but less steep making it easier to move up to higher ground, though it does take longer.
- **Screw:** A screw is just an inclined plane wrapped in a circle. One example of how a screw helps you is that it can be forced into something hard like wood with just the twisting of your wrist.

Be sure to emphasize that simple machines make work easier, but that comes with a tradeoff. Usually it is that you have to do something over a longer distance.



EVALUATE

Students can play the online Kahoot! quiz game located below the video which provides downloadable scores at the end of the quiz game. Alternatively, you can use the paper quiz or the exit ticket questions. All these resources are located below the video in the Assessment section.

