

Facilitation Notes

Engage ⌚ 5 min.

Ask students what happens during a kicking motion. Introduce the context of kinetic energy being transferred through a kick.





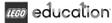
I can explain a change in an object's energy.
I can model the transfer of kinetic energy.
I can explain how kinetic energy is transferred from one object to another.

Kinetic Kicker

Students will construct a device to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

0 | Goals and Objectives

You can introduce the students to the objective and learning targets of this lesson.



Kinetic Kicker

How can a kick transfer energy?

1 | Introduction

Ask students to describe what is happening in a kicking motion, such as when they kick a ball. As needed, relate this to kicking activities relevant in your local context. *What typically happens to the object that has been kicked?*

When an object is moving, it has kinetic energy. But what if that object hits something else? What happens to its energy? Use a Kinetic Kicker to find out.



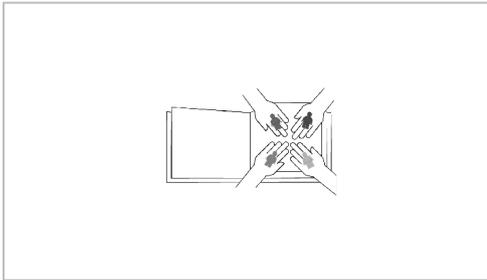
2 | Context

Discuss the key vocabulary *kinetic energy*. According to students' prior knowledge, you can introduce or reinforce the concept of kinetic energy.

- *What situations can you name where a moving object hits another object? (bowling, golf, etc.)*
- *What happens to the object that is hit, and what happens to the object that was moving?*

Explore ⌚ 12 min.

In groups of 4, students will build a Kinetic Kicker device and explore what happens when one puck is kicked into another puck.



3 | Groups and Roles

Divide the students into groups of 4. Use the blue, red, green and yellow LEGO® minifigures to assign student roles and help each student find which part of the collaborative model they will build. They can find the corresponding blue, red, green and yellow LEGO minifigure icons in the building instructions.

Build:

- Kinetic Kicker
- Pucks
- Color bar

Put one puck near the kicker and the others at the marks.
Activate the kicker and observe what happens to the pucks.
You can experiment with placing the pucks in different ways:

- Only place one puck at the first, second or third mark.
Take away the

10 : 00

⌚ - +



4 | Build and Explore

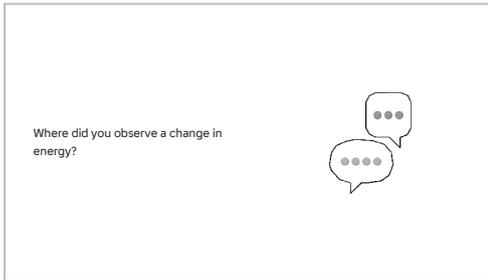
As groups finish building, they should begin exploring the Kinetic Kicker. For best results, they should use a smooth surface, such as a tabletop or tile floor. To support the experiment, prompt students to

1. Pair the color sensor and single motor using a connection card.
2. Show the purple color bar to the color sensor to activate the kicker.
3. Place one puck near the kicker arm and the others at the marks.
4. Observe what happens.

Students can take turns to experiment with the device. To deepen the learning, you could have groups document each experiment and record the distance the puck travels.

Explain ⌚ 5 min.

Students will discuss how energy is transferred with the Kinetic Kicker.



5 | Share

Students may share observations of the following changes in energy:

- The energy in the puck changed as it went from not moving to moving (kinetic energy).
- The energy in the puck changed again when it stopped moving.

You can prompt them to describe the transfer of energy modeled in this system. If transfer of energy is a new concept to students, you can use the model to explain it:

- Kinetic energy is transferred from the motor of the kicker to the puck. It is transferred again from one puck to the next.

Elaborate ⌚ 18 min.

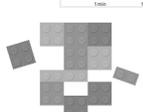
Students will use the Kinetic Kicker to further explore the transfer of kinetic energy, such as by lining up more pucks, building additional objects to kick and changing the mass of those objects. Afterwards, students will share reflections and relate the experience to real-life examples of kinetic energy transfer.

Explore more energy transfer with the Kinetic Kicker:

- Build and line up various objects to kick.
- Experiment with objects of different masses.

Can you explain how the transfer of energy changes in these different experiments?

10 : 00



6 | Build

Encourage students to modify the experiment by building their own objects and exploring changing the mass of the objects kicked. With increased mass but consistent force input from the kicker, they will observe that the objects accelerate less, resulting in less kinetic energy transferred.

To deepen their learning, you can have students document the experiments, including the objects tested and the results. After each experiment, prompt students to reflect on the energy transfer they observed.

Present one of your Kinetic Kicker experiments. Explain how energy is changed and transferred in your model.

7 | Share Your Build

To check student understanding, you can look for the following:

- Students can describe an object's change in energy.
- Students can model a transfer of kinetic energy.
- Students can explain how kinetic energy is transferred from one object to another.

Kinetic energy can be transferred between objects.

8 | In Real Life

Discuss how kinetic energy is being transferred in the two photographs. The kinetic energy from the bowling ball is transferred to the pins, and the energy from the bat is transferred to the baseball. Discuss how the energy changes in each object that is hit.

Evaluate ⌚ 5 min.

An optional evaluative prompt asks students to describe the transfer of kinetic energy in one of their experiments.

Choose one of your experiments with the Kinetic Kicker, and describe the transfer of energy.

9 | Show What You Know

You can ask students to write answers in their notebooks or use other methods established in your classroom.

Clean Up

10 | Clean Up