



LESSON PLAN

COLLISIONS GRADES 3-5

SUMMARY

Students explore the science behind the energy of moving objects. For this activity students need to be able to understand that the further up a ramp a marble is released, the faster it will move.

DURATION

Two+ 45-minute classroom periods (Engage/
Explore: 1 class period, Explain/Elaborate: 1 class
period, Elaborate/Evaluate: up to 1 class period)

PRE-ASSESSMENT QUESTIONS

Please see discussion questions located under
the video. These can be discussed as a group or
answered individually in student science notebooks.



ENGAGE

Have students put their hands together and rub
back and forth fast. This shows the students how
energy is being transferred between the hands
(moving objects), creating sound and heat energy.
Then show students a video of a slow-motion
collision in the context of sports (a foot kicking a
soccer ball, a tennis ball and racket, and so forth).
Plenty of examples can be found online.

MATERIALS

- Foam pipe insulation tubing or pool noodles, cut in half lengthwise (one or more)
- Marbles, small and large (at least one large, two small, in different colors)
- Small sticky note flags
- Wet erase markers
- Science notebooks
- Pencils

DIY Activity

- Several books
- Two surfaces at different heights
- Ruler
- Marker
- Binder clip
- 2 pencils
- Books
- Highlighter
- Tape
- Cup
- Candy (or other non-liquid material)
- Bowl
- Battery or other small heavy object
- An additional variety of classroom objects



EXPLORE

Explain to students that they will be exploring what happens to objects when they collide. They will be observing the motion of the objects before and after collision, and thinking about energy. Using half (lengthwise) of the diameter of a hollow tube of foam insulation or pool noodle, create a ramp with a long flat runout. Set up the half tube in a location where all students can see it (it may be useful to tape it to the wall and floor). Place one marble in the middle of the flat section. Make a mark partway up the ramp using a dry erase marker. Ask students to predict and create a chart (through discussion or in their science notebooks) on what will happen to both marbles when another marble (different color) is released at the middle of the ramp. Run the experiment three times to collect data and see whether the results are consistent. Use the wet erase marker to mark where each marble ends up after the collision. Discuss results vs. student predictions.

Now ask students to predict what they think will happen if a small marble is released at the top of the ramp (more speed) and collides with another small marble. Run the experiment three times. Discuss what happens. The stationary marble should move further than before because the faster moving marble that collided with it had more energy to transfer. Ask the following questions.

- What has changed compared to the initial trials? (The speed of the moving marble when it hits the stationary marble is much faster.)
- Have any other variables changed? (no)
- Is it fair to say that any change seen is the result of the motion of both marbles? (Yes, because only one variable has changed.)

Finally, ask students to predict what they think will happen if a large marble is released at the middle of the ramp and collides with a small marble.

Run the experiment. Discuss what happens. Ask students, what has changed in this scenario? (The size of the first marble. It is larger, heavier.) Have any other variables changed? (no) Is it fair to say that any change seen is the result of the motion of both marbles? (Yes, because only one variable has changed.) Similar scenarios could be set up using toy cars and track.



EXPLAIN



WATCH THE GENERATION GENIUS COLLISIONS VIDEO AS A GROUP

Then facilitate a conversation using the Discussion Questions.



ELABORATE

Use the DIY Activity to create your own Rube Goldberg machine just like Zoe's from the video. Then, individually or as a group, design your own Rube Goldberg machine using collisions.





EVALUATE

Ask students to sketch a model of their Rube Goldberg machine in their science notebooks, labeling their drawing to show how each collision plays a part in the transfer of energy. Alternatively, students could verbally describe their inventions.



EXTENSIONS

Explore the science behind collisions by connecting it to what they are currently playing in gym class.

