

CRASH DUMMIES (MODIFIED FOR ADEED)



Science Concept:

Forces cause change in speed or motion.

Objectives:

The student will:

- design a vehicle that will protect an egg passenger from changes in motion and speed;
- predict how the safety device in the model vehicle will work; and
- write a descriptive paragraph about the safety device in the vehicle.

GLEs Addressed:

Science

- [4] SB4.1 The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by simulating that changes in speed or direction of motion are caused by forces.
- [4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Writing

- [4] W2.1.1 The student writes about a topic by writing a paragraph that maintains a focused idea and includes details that support the main idea.

Vocabulary:

force – strength or power exerted upon an object; in physics, an influence on a body or system, producing or tending to produce a change in movement or in shape or other effects; the intensity of such an influence

motion – agitation or disturbance of a physical substance; an irregular movement, shaking, or oscillation

outcome – a conclusion reached through a process of logical thinking; a final product or end result

Materials:

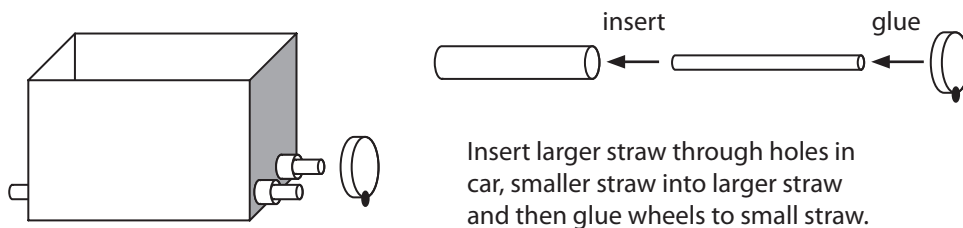
- Cup
- Playing Card
- Coin
- Skateboard or scooter (one per pair)
- 2-liter bottle with lid (one per pair)
- Heavy cardboard or something to create a ramp (one per pair)
- Block or large book to put under the cardboard to create a ramp (one per pair)
- Masking tape
- Sharp pencil (to punch holes)
- Scissors
- Half-gallon milk cartons, or small boxes similar in size (one per pair)
- Eggs (one per pair, plus extras)
- Round coffee stir straws
- Larger drink straws
- Small wooden wheels (or something to use for wheels)
- Variety of materials for creating egg safety devices, including but not limited to:
 - Toilet paper or tissues
 - Cushion foam, 1/2 to 2 inches thick, cut into squares

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- Hot glue gun with glue sticks
- Packing peanuts
- Shredded paper
- Rubber bands
- String or ribbon
- Popsicle sticks
- Newspaper
- Polyester batting
- Masking tape
- Duct tape
- STUDENT WORKSHEET: “Crash Dummies!”
- STUDENT WORKSHEET: “Magic Coin”

Activity Preparation:

1. Using a sharp pencil, punch four holes at the bottom of the sides of the carton to push large straws through. (See diagram below.)
2. Insert the smaller straws into the large straws and attach the wooden wheels with hot glue (teacher or other helper should do this) being careful not to glue the straws together. The smaller straw should freely rotate within the larger straw.
3. Using the milk carton base vehicle, students should design safety devices onboard to protect an egg during a crash test. They may use extra cardboard to build rooftops, but they must maintain a window area in the front.



Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: observing, communicating, and predicting

1. Place a playing card on the top of a glass (open end up) and then place a coin on top of the card. Distribute the STUDENT WORKSHEET: “Magic Coin” and ask students how they think they might get the coin to fall into the cup without lifting the card. Students should record their answer on Question #1 of the worksheet.
2. After students have completed their response to Question #1, quickly flick the card horizontally. The card should fly out and the coin should drop into the cup. Allow students to discuss their observations as a class and answer question #2 on STUDENT WORKSHEET: “Magic Coin.”
3. Ask students what they think might happen if the card is pulled, rather than pushed. Ask students to record their answers on the worksheet.
4. Place the card and coin back on the cup. Pull the card quickly; the coin should drop into the cup.
5. Ask students why this happened. If necessary, explain that because a force was applied to the card, but not the coin, the card moved with that force, while the coin remained. (NOTE: The coin remains momentarily at rest before the force of gravity caused it to fall into the cup.)

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6. Ask students to think of other examples where a force may be exerted on one object while another remains at rest (e.g., passengers in a car, dirt flying off a shovel, a ball being thrown).

Explore

Process Skills: observing, predicting, and communicating

7. Remind students that forces cause change in speed or motion. Discuss how this relates to passengers in a car.
8. Explain students will work in pairs to explore forces and motion with a skateboard (scooter), a 2-liter bottle, and a ramp. Explain the ramp will be used to create the force on the skateboard; the 2-liter bottle will be a passenger. Divide students into pairs and distribute a skateboard and 2-liter bottle to each pair. Distribute STUDENT WORKSHEET: "Crash Dummies!"
9. Indicate which wall or solid object students should aim their vehicles at. Instruct students to complete the worksheet as they explore. Students may use tape to secure the bottle to the skateboard, if desired.

Generalize

Process Skills: communicating, making generalizations, inferring

10. Ask the following questions and record student responses, including any new words, on chart paper or the board:
 - a. What made the skateboard move?
 - b. What happened to the bottle when a force was applied to the skateboard?
 - c. Why do you think the bottle fell off?
 - d. What would happen if you rode on a giant skateboard and it stopped quickly?
 - e. How does this compare to other events you might experience in your life?
 - f. What can you do to protect yourself in one of these situations?

Apply

Process Skills: describing and communicating

11. Ask students to write about what they have learned in their science journal. Instruct them to identify several other examples that show a force changing speed or motion

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RUBRIC

Assessment Task:

Using the materials provided, create a vehicle with at least one safety device that will protect an egg passenger from changes in motion and speed. Predict what may happen to your egg passenger during a crash in your vehicle. In your prediction, explain how change in speed or motion are caused by a force. You may include ideas about more than one possible outcome. After building the model, test it by crashing it into the wall or a solid object. Write a descriptive paragraph with at least three sentences about how your safety device worked. You may include ideas about how to improve your safety device.

Rubric:

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student designs a vehicle that will protect an egg passenger from changes in motion and speed.	[4] SB4.1	The student may create, build, and test a vehicle with no safety device to protect passengers from changes in motion and speed.	The student creates, builds, and tests a vehicle with at least one safety device that protects passengers from changes in motion and speed.	The student creates, builds, and tests a vehicle with more than one safety device that protects passengers from changes in motion and speed.
The student predicts how the safety device in the model vehicle will work.	[4] SA1.1	The student records no predictions about the safety device.	The student records a prediction about the safety device and explains a change in speed or motion is caused by a force.	The student records a prediction about the safety device and explains a change in speed or motion is caused by a force. The student includes at least one other possible outcome.
The student writes a descriptive paragraph about the safety device in the vehicle, including how the device worked.	[4] W2.1.1	The student writes less than three sentences that may describe the safety device or the outcome of the crash test.	The student writes three or more sentences in paragraph form that describe the safety device and the outcome of the crash test.	The student writes four or more sentences in paragraph form that describe the safety device, the outcome of the crash test, and includes ideas for improvement of the device.



NAME: _____
MAGIC COIN



Directions: Answer the following questions:

1. How do you think you might get the coin to fall into the cup without lifting the card?

2. Why do you think the coin fell down while the card flew sideways?

3. What do you think might happen if I pull the card, rather than push?

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CRASH DUMMIES!



Directions: Answer the following questions:

1. Predict what will happen to the 2-liter bottle when a force is applied to the skateboard.

2. Test your prediction and explain the results.

3. What will happen if the skateboard stops quickly?

4. How can you keep the bottle on the skateboard during a quick stop?
