First Law of Motion Misconception: Right on Target!

Summary

A common misconception is that force is needed to keep an object in motion and that a moving object stops when its force is used up. Day 1 - Students will make geometrical net patterns to drop on a bull's-eye target for the experiment the next day. Day 2 -- Students will get their shape, find a partner, and move into the gym for an experiment proving that an object (the shape) will continue moving until a force (air resistance) is applied to it. They will attempt to drop their net pattern directly on the bull's-eye target.

Additional Core Ties

English Language Arts Grade 3

Reading: Informational Text Standard 7

Mathematics Grade 3

Strand: GEOMETRY (3.G) Standard 3.G.1

Time Frame

2 class periods of 45 minutes each

Group Size

Pairs

Materials

- Copies of geometrical net patterns (see attached cube net, rhombic pyramids and rectangular prism printouts)
- Scissors
- Tape
- Colored bull's-eye targets (see attached) -- one per group
- Paperclip
- Masking tape
- Rulers with quarter inch
- 1 ball of any size
- Right on Target worksheet & data sheet (see attached)
- Cones (optional)

Background for Teachers

- A common misconception among students is that force is needed to keep an object in motion and that a moving object stops when its force is used up. In actuality, Newton's First Law of Motion states that an object at rest stays at rest and an object in motion stays in motion unless acted upon by a force.
- Car crash with seatbelt videos:
- Watermelon Seatbelt Campaign (watermelon)
- Crash test Child without seatbelt
- Find an area that's at least 10-15 meters in length (e.g. gym, playground asphalt, etc.)

Student Prior Knowledge

Students should already understand 3rd grade Science Standard III which explains the relationship between the force applied to an object and resulting motion of the object. Students should have an

understanding of what force is (a push or a pull).

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
e. Use instruments to measure length, temperature, volume, and weight using appropriate units.
3. Understand Science Concepts and Principles
c. Explain science concepts and principles using their own words and explanations.

Instructional Procedures

Day 1
: Make Geometrical Net Patterns for Experiment

Beforehand, the teacher needs to print out the three different geometrical net patterns. (See attached.) Each net pattern should have its own color to help for identification purposes. (If you have a class of 24 students, print 8 cube nets on red, 8 rhombic pyramids on yellow, and 8 rectangular prism nets on green.)

Students can choose which geometrical net pattern he/ she would like to make.

Pass out scissors and tape. Have students cut out his/ her pattern and tape the shape together. Make sure students don't cut off the tabs.

Extension 1: The teacher may choose to share a quick geometry read aloud like *The Greedy Triangle by Marilyn Burns* or *If You Were a Quadrilateral* by Molly Blaisdell. Ask the students what the difference is between plane figures from the examples in the books and 3D figures like what they built. Introduce attributes and faces.

Extension 2: Teach a quick mini-lesson on the different categories of shapes with the attached graphic organizer entitled Polygon Layout.

Day 2: Experiment

Show the video clip of the car crash with the watermelon wearing a seatbelt. (Optional - show second video.) Ask the students why the watermelon with the seatbelt stayed in place while the watermelon without the seatbelt splattered. (Students' probable answer: the watermelon was wearing a seatbelt.) The teacher will then explain that the seatbelt worked because an object in motion will stay in motion unless acted on by a force (which is the seatbelt). Also, even though the car stopped moving, the watermelon without the seatbelt kept moving because it didn't have a force acting upon it until it splattered. This is Newton's First Law of Motion.

The teacher will roll a ball down the aisle of the classroom. Ask students why the ball stopped. Then have a class discussion about why the ball stopped. Connect Newton's First Law. Explain that the forces that made the ball stop were the friction from the carpet, air, and whatever it ran into. The force that made the ball go was your arm throwing it (strength).

Have students retrieve their geometrical net pattern. Then have students look at the sides on their net pattern and identify what quadrilateral they find. Have students locate their vocabulary word or definition. Next, instruct students to find the person that has the exact matching shape and match to their vocabulary term. (For example, one partner will have the vocabulary term and the other partner has the definition.)

Experiment: Tape a long starting and finishing line about 10-15 meters apart. (See attached diagram.) Both tape lines should be long enough so that each pair can comfortably line up on the tape. You can use cones on the tape to mark where each pair begins and ends. Each pair needs a ruler, paperclip, Right on Target worksheet, and colored bull's-eye target. (The worksheet can later be glued into students' science journals.) The partner with the vocabulary term will be Partner 1, and the partner with the definition will be Partner 2.

Assign each team to a bull's-eye. Each bull's-eye should be placed close to the ending line and spaced out about 3 feet apart from the surrounding groups. The teacher can start everyone at

the same time. Partner 1 will run as fast as possible without stopping until he/ she gets to the finish line. Meanwhile, partner 2 places the paper clip where the net pattern first dropped.
Partner 1 predicts and then measures to the quarter inch and Partner 2 rechecks. Record on the worksheet the measurements.
Switch roles and repeat the experiment attempting to hit the bull's-eye target.
Discuss why everyone missed the target. Ask students what they need to do different to hit the target. The teacher may need to explain that students will want to drop the shape sooner because the shape keeps moving even though they dropped it.
Trial 2 -- Do the experiment again while running at the same speed. Students should decide with his/ her partner when to drop the shape. Mark the place with the same paper clip.
Trial 3 -- Now try the experiment while walking.
In class --Ask students why more shapes hit (or were closer to) the bull's-eye target when students were walking rather than running at full speed. Explain that running fast increased each student's force and speed.
Complete the Right on Target Data Sheet in the classroom.

Strategies for Diverse Learners

Sentence Frames
:

A force is a (push) or a (pull).
An object at (rest) stays at (rest) and an object in (motion) stays in (motion) unless acted upon by a (force).
(Leave the words in parenthesis out and let students fill in the blanks.)

Extensions

Students can fill their geometric net patterns with a weight and see if that affects when they need to release their shape.
As a class, you may choose to graph students' data.

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