MOTION COMMOTION
KINDERGARTEN-SECOND

Matter and Energy TEKS

Kindergarten:	K.6B, K.6C, K.6D
First Grade:	1.6B, 1.6C, 1.6D
Second Grade:	2.6B, 2.6C, 2.6D

Vocabulary

above, attract, back and forth, behind, below, closer to, down, farther from, fast, friction, gravity, in front of, kinetic, magnet, nearer to, position, potential, pull, pulleys, push, repel, rolling, rough, round and round, sliding, slow, smooth, spinning, straight, underneath, up, zig zag

Pre-Show Activity

Pre-Show Lesson: Energy and Motion

Post this question on the board: "How does energy make things move?"

Materials:

Per class: empty can with a lid (like a coffee, baking soda, oatmeal or paint can), twist tie or short pipe cleaner, hex nut, large rubber band, scissors, Yo-yo

Per partner: pull-back race car, empty can with a lid (like a coffee, oatmeal or paint can), twist tie or short pipe cleaner, hex nut, large rubber band, scissors

Procedure:

1. Show students a special can that you have trained to always come back to you when you call it. Demonstrate using the "come-back can" (assembly instructions in Appendix A-1). Place the can on the floor and gently roll it away from you. If you time it just right, you can figure out when the can will start to roll back to you. Then you can "tell" the can to come back, so that it looks like the can is doing what you tell it to do.

2. Discuss the direction that the can is moving (rolling back and forth or round and round). Practice directional vocabulary by having the can go underneath, beside, in front of and behind an object. Have students describe the location of the can using these words. Ask, “Is is possible for the can to move in a zig zag or does it only move in a straight line?” Test it.

3. Ask students, “Why does the can always come back? Is it because I call it? How could we test that?” Test the can without calling it. Have students turn to a partner and discuss why they think the can is coming back.

4. Give each partner a pull-back race car. Tell them to experiment with the race car and think about how it behaves similar to the comeback can. Think about how the race car works. Give students a couple minutes to just play with the car and think.

5. Next, pair up younger students. Have them use the race car to show the positions that you give. After a couple of minutes they will switch places and the other person gets to use the race car. Tell students that if they cannot make the car do what they want by pulling it back, they can just push it forward or move it in some other way.
   Examples of positions to demonstrate:
   - Demonstrate the race car traveling under your partner.
   - Demonstrate the race car traveling in a straight line.
   - Demonstrate the race car traveling in a zig zag motion.
   - Demonstrate the race car traveling slowly.
   - Demonstrate the race car traveling fast.
   - Demonstrate the race car spinning.
   - Demonstrate the race car sliding.
   - Demonstrate the race car rolling.

   You may want to ask if they used a push or a pull-back to get the car to move the direction that they wanted for each position.

6. For older students, you may want to focus more on what is happening in the can and in the race car. Show students a toy Yo-yo. Discuss how it works by winding up (stored potential energy) and unwinding (kinetic energy). Discuss how the car may work in the same way. Have students give ideas.

7. For older students, give each group the supplies to make a come-back can but do not tell them how to do it. Students will try to make their own come-back can.

8. Debrief with all students, explaining how the can works. You may want to show them the inside of your can. To understand how the come-back can works you have to understand energy. Energy comes in many forms. One form of energy is motion, called *kinetic energy*. Another form is stored, or potential, energy. The come-back can uses both forms. When you push the can, you give it kinetic energy and it moves away from you. The hex nut holds one length of rubber band still while the rolling can causes the other rubber band to twist around it. The can rolls until the rubber band is completely twisted. This is when kinetic energy becomes potential energy – the can is not moving, but it has the ability to do so. As the rubber band unwinds, the potential energy again becomes kinetic energy and the can rolls back to you.

Post-Show Enrichment Activities

Activity One: Magnets

Materials: magnets, baggie of objects (coins, buttons, paperclips, etc), paper, cardboard, plastic

Procedure:

1. Hide a magnet underneath the fingers of your right hand by curling your fingertip over it.
2. Reach over and pick up the two paper clips, one in each hand. Show them to the audience, showing the back of your hand so that the magnet is not exposed. The paper clip in the right hand should be touching the magnet.
3. Hold the right hand with the fingers pointed down and the paper clip pointing out under it. Take your other paper clip and place it at the end, so that the tips of the paper clips are touching. Dramatically remove your left hand so that they remain stuck together.
4. Ask students to infer what happened. Explain that magnetism (the invisible force) can push and pull through some materials such as paper and plastic.
5. Paper clips are made of steel. If you hold a paper clip close to a magnet, you can feel the magnet pulling on the paper clip with an invisible force called magnetism.
6. All magnets have two ends or poles (north & south). If you put the poles of two magnets together, they will either pull together or push apart. They will pull (attract) each other if the poles are different. They will push (repel) each other if the poles are the same.
7. Give each group a baggie of objects (coins, buttons, paperclips, etc.) and a couple of magnets. Give students time to experiment with magnets. Tell them to especially notice when the magnet pushes and when it pulls. Have students test the distance between a magnet and an object when pushing and pulling. Have students put something in between them, like a piece of paper, cardboard or plastic and see if the magnet works.
8. Challenge students to design their own “magic trick” using magnetic forces. They should be able to explain if the magnet is pushing or pulling.

Activity Two: Pulleys

Materials:

Per group: a plastic container with a handle (milk cartons work well), 2 m of heavy cord, sand

Procedure:

1. Take students out to the flag pole and show them how a pulley works. You can also demonstrate this on some blinds. Notice the direction of the forces. You are pulling down, but the flag is going up. Pulleys are used to change the direction of a force.
2. Students will add 200 ml of sand to a milk carton and put the lid on.
3. Carefully tie a piece of cord around the handle of the container.
4. Raise the carton by its cord off the floor. Notice the amount of force needed to raise it.
5. If you have a pulley, you can use it here, if not, students can use a door knob, or their desk.
6. Students will now drape the cord over the door knob or desk and pull down on the opposite end to lift the container. Compare it to when students lifted up. Which is heavier? With older students you may want them to use a spring scale to measure the force needed on steps 4 and 6. They should see that the actual force needed is the same. You are only changing the direction of the force. The mass of the object did not change. The difference is, when you pull down, gravity is helping you.

Activity Three: Friction

Materials: marbles, sweater, dishsoap

Procedure:

1. Have students rub their hands together. Ask, "What do you feel?" Students should feel heat. When two objects rub together there is friction. Friction slows things down and causes heat.
2. Ask students if they have ever tried to slide across the kitchen floor with their socks on. Would it be possible to slide across a sidewalk in your socks? Why not? Rough surfaces like the sidewalk produce more friction than smooth surfaces.
3. Have students complete front and back of the worksheet *Exploring Friction* (Appendix A-2). Younger students may need to do this as a class.

Appendix

A-1

Come-Back Can

Materials: Empty can with a lid (like a coffee, oatmeal or paint can), twist tie or short pipe cleaner, hex nut, large rubber band, scissors

Procedure:

1. Punch two holes in the lid and the bottom of the can. Cut the rubber band once so it is one long strip. Thread the rubber band through the holes in the bottom of the can so that both ends are inside the can.
2. Stretch the ends of the rubber band through the holes on the lid of the can. Secure the lid in place and tie the ends of the rubber band together.
3. Wrap the pipe cleaner (or twist tie) around the hex nut. You should have two "bunny ears" of equal length sticking up when you're done.
4. As you hold the lid away from the can (a partner can help), wrap each "bunny ear" around one of the rubber bands that runs through the inside of the can. The hex nut should hang from the middle of the rubber bands.
5. Place the can on the floor and gently roll it away from you. Watch what happens! If you time it just right, you can figure out when the can will start to roll back to you. Then you can "tell" the can to come back, so that it looks like the can is doing what you tell it to do!

http://www.msichicago.org/online-science/activities/activity-detail/type/print/activities/make-a-comeback-can/

A-2

Name _____ Date _____

Exploring Friction

Directions: Complete the activities below and answer the questions. Circle the correct answer and explain when needed.

Marble Motion

Procedure:

1. Lay a sweater or jacket on the desk.
2. Roll a marble across the sweater.
3. Remove the sweater.
4. Roll the marble across the desk.

1. Did the marble roll faster across the sweater or the desk? Circle your answer.

   Sweater Desk

2. Did the sweater or the desk make more friction with the marble? **Why?**

   Sweater Desk

Slip and Slide

Rub your hands together quickly many times.

1. What did you feel?

Add some dishwashing liquid to your hands. Rub them together quickly.

2. Did your hands feel the same? Yes No

3. Which makes more friction, soapy hands or dry hands? **Why?**

Soapy Dry

Rolling Along

Pick up two marbles and rub your hands together.

1. Did you feel any heat?

Yes No

2. Which produces less friction, sliding or rolling?

Sliding Rolling

Put a little dishwashing soap on your hand and pick up the marbles. Rub your hands together.

3. Did your hands move more easily?

Yes No

4. What else could you use besides dishwashing soap to make your hands smoother?