Topic: Energy : Lesson 3 Transfer of energy when objects collide

Objectives:

1. Students will make observations and provide evidence of energy being transferred from object to object
2. Students will make predictions about what happens to energy in experiment where objects collide.
3. Students will record and use data from experiment to make statements regarding transfer of energy between objects.
4. Students will describe the relationship between energy and forces. (contact force transfer energy to change object's motion)

Materials:

- Marbles (glass, large and small sized)
- Rulers with a channel in the middle
- Masking tape (for marking where 2nd marble stops after end of ramp)
- Books or other flat objects to stack on top of one another
- Data recording sheet (enough for each child)
- White board
- Dry erase markers

Next Generation Science Standards:

4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat and electric currents.

4-PS 3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Flow of lesson:

1. Review homework with students. Discuss and compare students responses. Give students opportunity to ask any questions.
2. Ask the students:

   Do objects in motion have energy? Give think time and then allow students to offer responses. Write response on write board

   What happens to that energy when two objects collide? Give think time and then allow students to respond. Write student responses on the whiteboard.

3. Let students know that today we will be conducting an experiment to see what happens to The energy when objects collide and how the motion (kinetic) energy is effected.
4. Have students make and write down predictions in their notebooks about what they think will happen to the marble at the bottom of the ramps when the different size marbles collide.

   2 large marbles

   1 large marble (at top of ramp) 1 small marble (bottom of ramp)

   1 small marble (top of ramp) 1 large marble (bottom of ramp)

   2 small marbles

5. Divide the students into groups of 4 (1 group will have 3 students) and demonstrate how to set up the experiment. Then distribute the materials and data sheets to each group. Make sure that each student has their own data sheet to record on.

6. Make sure the groups are spread out enough so they have adequate room/space to conduct the experiment. Allow students to start experiment and give them about 20 minutes to Conduct the experiment. Then call the group back together.
7. Once the whole class is back together, Have students look at their prediction that they made earlier in the class. Have them compare the predictions to the data they collected and write in their notebook their responses. Ask for students to volunteer what they found when comparing their predictions with the actual data and sketches from the experiment. Put some of the responses on the whiteboard and discuss them with the class.
8. Help students to realize the following:
    - When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding ; as a result, the air gets heated and sound is produced.
    - When objects collide, the contact force transfers energy so as to change the objects' motion.
    - The faster a given object is moving, the more energy it possesses.