BETTERLESSON

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4th Grade Science : Unit #1 - Speed and Energy : Lesson #5

Moving Pennies

Objective: *SWBAT demonstrate how energy can be transferred from one object to another.*

Standards: 4-PS3-1 4-PS3-2 4-PS3-3 4-PS3-4
Subject(s): Science
60 minutes

1 Engage - 5 minutes

The faster a penny is moving, the more energy it possesses. When objects collide, energy can be transferred from one object to another, changing their motion. In order to be successful with this lesson, it is important that I spent time making sure all students understand what energy is.
I begin this lesson by leading a brief review discussion about what energy is. Through this discussion, I informally assess what students remember about energy from the previous lesson. Through this discussion, I also seek to discover what students want to learn about energy. This helps me design future lessons.
I explain to my students that today we will experiment with some simple everyday items to demonstrate energy and motion - pennies.

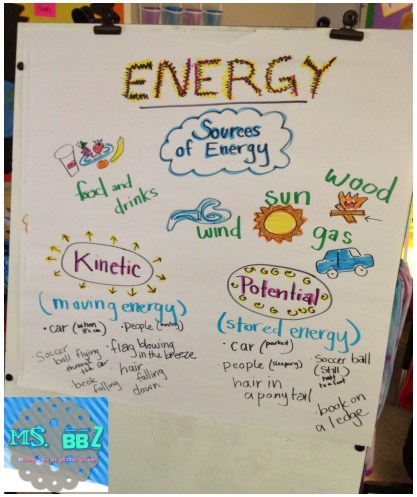
2 Explore - 15 minutes

In order to allow for collaboration and inquiry in my classroom, students partner up with their learning partner.
I give each partner seven real pennies. Next, I direct students to work together to demonstrate how energy can be used to create motion. Students record their demonstrations in their science notebooks.
Scientific inquiry reflects how scientists come to understand the natural world, and it is at the heart of how students learn. From a very early age, children interact with their environment, ask questions, and seek ways to answer those questions. Understanding science content is significantly enhanced when ideas are anchored to inquiry experiences.
Scientific inquiry is a powerful way of understanding science content. Students learn how to ask questions and use evidence to answer them. In the process of learning the strategies of scientific inquiry, students learn to conduct an investigation and collect evidence from a variety of sources, develop an explanation from the data, and communicate and defend their conclusions.
In this video you can see two students wresting with the idea of what to do. They are unsure of how to transfer energy from one penny to another.
Link (http://www.youtube.com/embed/RHMQju9l6vQ?list=PLiZ__4QF7jtDSEV1Kx5881tSbIccPBHGR)

In contrast, this video shows two students who have discovered, (very quickly) how to flick one penny in order to cause a collision and send another penny sailing. Be sure to listen as one of the students explains the science behind why this works.
Link (http://www.youtube.com/embed/Y6299z3fOIA?list=PLiZ__4QF7jtDSEV1Kx5881tSbIccPBHGR)

3 Explain - 10 minutes

Next, I lead a discussion about the concept of energy - the ability to do work. I remind students that there are different types of energy. One type of energy is potential energy. I tell students that potential energy is stored energy. Another type of energy is kinetic energy. Kinetic energy is motion.
(I will be creating a poster like this through our discussion.)



I also tell students about conservation of energy. I tell students that energy cannot be created or destroyed, it is transferred from one form to another. Energy leads to motion.

Then I show the Bill Nye Science video below.
Link (http://www.youtube.com/embed/zTXW9aRO23Y)

4 Elaborate - 15 minutes

After watching the video and discussing the types of energy, I give students an opportunity to refine their demonstrations from earlier in the lesson. Students can keep their previous experiments or alter them.
I also pose one more challenge:
Since energy can be transferred through collisions, one of the partner demonstrations must show energy transfer through a collision.
(If no partner experiments have done so, I demonstrate to students how they can spread the pennies out on their tables and flick a penny into the others. The movement of the first penny will cause movement of the other pennies. I ask students what would happen if they were to flick the penny faster or slower (softer).

REFINING IDEAS: Developing a Conceptual Understanding

It was very interesting to watch my students and stay silent as I observed their thinking. They had some very creative ideas about how they would transfer energy from one penny to another, but eventually all students discovered that they could slide a penny into another one and cause that other penny to move. Even though this is something they may have seen before or even experimented doing, when they discover that this works because of science, the pure joy on their faces is worth every cent. (no pun intended) They were also very quick to realize and show that the faster they flung the first penny, the more energy they could transfer, and thus make the other penny go further.
You can watch my reflection video below to hear more thoughts about why I am a true believer in inquiry and "doing" science rather than reading about science concepts.
Link (http://www.youtube.com/embed/YS_MCwaDeFQ)

5 Evaluate - 10 minutes

After students are given a chance to refine their experiment, students present their demonstrations to the whole class. In the student demonstrations, students must explain what they learned about energy. Students also turn in their science notebooks from the day.
As a conclusion to the lesson, I explain that moving forward students will have more opportunities to experiment with energy.