

Kinetic, Potential, or Both?

Strand	Force, Motion, and Energy
Topic	Investigating motion
Primary SOL	4.2 The student will investigate and understand characteristics and interactions of moving objects. Key concepts include d) moving objects have kinetic energy.
Related SOL	4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which k) data are communicated with simple graphs, pictures, written statements, and numbers.

Background Information

Energy may exist in two states: kinetic or potential. Kinetic energy is the energy of motion while potential energy is stored energy. One example of potential energy is to envision a rounded boulder on top of a hill. This boulder has potential energy because it is on top of the hill and could roll down the hill by itself. When it begins to roll down the hill, it begins to gain kinetic energy and loses potential energy. The faster it goes the more kinetic energy it has.

Materials

- For each group:
 - Balloon
 - Rubber band
 - Wool cloth
 - Spring
- Science journals or loose leaf paper
- Old magazines
- Glue sticks

Vocabulary

kinetic energy, potential energy, transfer

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Ask students if an adult has ever told them to move their glass away from the edge of a table.
2. Discuss why adults may be so insistent on keeping glasses of liquid away from the edge of a table. If students do not associate energy with this situation, offer prompts that suggest adults know about the two types of energy.

3. Ask students to try to figure out what the two types of energy might be. If students cannot identify the two types of energy, then the teacher may share with students that these two types of energy are all around us: kinetic and potential energy.

Procedure

1. Place students into groups of three to four students.
2. Give each group of students the materials for each group.
3. Ask students to view their group's materials and discuss possible ways to give each one potential energy. Remind students that there is usually more than one way to complete this task for each item.
4. Students will then try to give each item potential energy and allow it to transfer to kinetic energy. They must list in their science journals or on loose leaf paper each way they gave each item potential energy and then describe their observations of both potential and kinetic energy. Encourage children to be creative. *(Note: Balloons may be a choking hazard. Also, by blowing up a balloon, a student gives the balloon the potential to fly around the room if let go. When pushing down a spring, there is the potential it will spring up erratically. Please set safety expectations for each material before use and have students wear safety goggles!)*
5. During the activity, students will discuss possible options for providing potential energy to objects with others in their group. They should explain their observations using phrases like, "gaining kinetic," or "losing kinetic." The teacher should circulate and ask groups and individuals guiding questions. One question may be: "What does your item look like when it has a lot of potential energy?" Encourage students to ask you questions along the way and to predict outcomes before testing their materials.

Conclusion

1. Hold a class discussion in which students present what they believe is their most original way to give a material potential energy and how they changed it to kinetic energy. Encourage questions, predictions and self-assessment throughout the discussion.
2. Have students use old magazines to cut out two pictures that show kinetic energy, potential energy, or both types of energy.
3. Have each student glue the magazine pictures in his or her science journal or onto loose leaf paper and label the different forms of energy beside each picture.

Assessment

- **Questions**
 - In a picture, how might one infer that an object has kinetic energy?
 - Which items in the room have the most potential energy?
- **Journal/writing prompts**
 - Tell about a time when you had more potential energy than you were used to. Also, tell what kinetic energy came from this potential energy.
 - Describe the potential and kinetic energy involved in your favorite amusement park ride.

- **Other**
 - Give the class random examples of energy and have them give a sign to differentiate between potential and kinetic. Students might run in place to show kinetic energy and put their hands in the air to indicate potential energy.
 - Grade their magazine cut-out activity.

Extensions and Connections (for all students)

- Build a bulletin board using a roller coaster to illustrate the workings of potential and kinetic energy. Have students make, label, and write explanations for different points in the roller coaster. Students may bring in pictures of themselves on roller coasters to add to the decorations.
- Have students bring in pictures enjoying potential or kinetic energy and post them on a wall in the classroom.
- Have students notice at least one instance of potential and kinetic energy at lunch. Discuss their observations after lunch.
- Use scientific words in class all day. For example, when praising the students for raising their hands to ask questions say, “I like the way you give your hand so much potential energy so I can tell you want a chance to speak. Thanks!” Encourage students to speak this way in class and at home to astound their teacher and parents.

Strategies for Differentiation

- Have students work in groups with strength-based roles assigned where one group member might be the recorder.
- Provide a cue guide or reminder guide of the meaning of gaining kinetic energy and losing kinetic energy.
- Create a “choice board” containing places (highway, farm, supermarket, factory, playground, amusement park, restaurant, harbor, etc.) where potential and kinetic energy can be observed. Students could either list examples of potential and kinetic energy, or take photographs of examples of the two types of energy.
- Provide students with simple construction items (balsa wood, clay, toothpicks, cardboard, etc.). Direct students to build a model of potential and kinetic energy (e.g., a ramp with a marble at the top; rolling the marble down the ramp).