SUPPLEMENTAL LESSONS

Science Grade 9
4th Quarter

4th Quarter Grade 9
Revised Standards on Force, Motion, and Energy

Learning Competency: Create a device that shows conservation of mechanical energy

Lesson Focus: Conservation of Mechanical Energy

Introduction

Activating Prior Knowledge

A. Vocabulary

Make the students define each word in the concept Conservation of Mechanical Energy, and then make them define the concept in general.

B. Quick Recall

Ask the students to differentiate Potential Energy (PE) and Kinetic Energy (KE) and how they are related to Conservation of Mechanical Energy.

C. Pretest

Answer the following questions:

1. A tennis ball, of mass 120 kg, is dropped from a height of 5 m. Ignoring air friction, what is the potential energy of the ball when it has fallen 3 m?
2. What is the velocity of the ball at question number 1, when it hits the ground?
3. A ball rolls down a hill which has a vertical height of 15 m. Ignoring friction, what would be the gravitational potential energy of the ball when it is on top of the hill?
4. What would be the velocity of the ball in question number 3 when it reaches the bottom of the hill?

Body

Activity – Conversion of Energy (Potential to Kinetic)

Materials:

- a length of plastic pipe, diameter = 20 mm
- marble
- masking tape
- measuring tape

Procedure:

1. Put one end of the pipe on top of a table so that it will align parallel to the top of the table; tape it with the masking tape.
2. Lift the other end of the pipe, on a height not too high above the table and hold it still.

3. Measure the vertical height from the top of the table to the opening of the pipe above it. (Record your measurement.)
4. Let the marble roll from the top of the pipe until it reaches the other end.
5. Answer the following questions according to what you have conducted.

   What can you say about the velocity of the marble (i.e. fast, slow, at rest):

   a. before letting it roll on the pipe and what does this mean for its gravitational potential and kinetic energy?

   b. when it reaches the other end of the pipe and what does this mean for its gravitational potential and kinetic energy?
6. This time, lift the pipe as high as it will go.
7. Measure the vertical height from the top of the pipe to the table. (Record your measurement.)
8. Let the marble roll again as to what you did in procedure number 4.
9. Answer the following questions according to what you have conducted.

   a. What can you say about the velocity of the marble (i.e. fast, slow, at rest) before letting it roll on the pipe and what does this mean for its gravitational potential and kinetic energy?

   b. Compared to the first attempt, what was different about the height of the top of the tube? How do you think this affects the gravitational potential energy of the marble?

   c. Compared to your first attempt, was the marble moving faster or slower when it reaches the other end of the pipe and what does this mean for its gravitational potential and kinetic energy?

Conclusion

Post-test

Solve the following problems.

During a flood, a tree trunk of mass 100 kg falls down waterfall. The waterfall is 5 m high. If air resistance is ignored, calculate:

1. The potential energy of the tree trunk at the top of the waterfall.
2. The kinetic energy of the tree trunk at the bottom of the waterfall.
3. The magnitude of the velocity of the tree trunk at the bottom of the waterfall.

Self-reflection

The Roller Coaster

A roller coaster ride at an amusement park is one of the many applications of conservation of mechanical energy. In your own words, explain how this concept is shown by this ride.

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4th Quarter Grade 9
Revised Standards on Force, Motion, and Energy

Learning Competency: Analyze how powerplants generate and transmit electrical energy.

Lesson Focus: Powerplant

Introduction

Activating Prior Knowledge

A. Vocabulary

Make the students identify the different types of powerplants then differentiate one from the other.

B. Quick Recall

Ask the students to give the function of a generator.

C. Self-reflection

Make the students reflect on the following questions and ask some to share their thoughts to the class.

1. Why should we care about how electricity is generated?
2. How does electricity impact our daily lives?
3. How is electricity generated?

Body

Activity – Build a Turbine

Materials:

- Cardboard tube (i.e. as used for aluminum wrap)
- Cardboard for holder and fins
- Cork
- Craft knife
- Household fan
- Large pins
- Marker pen
- Tape
- Timer

Procedure:

1. Push a pin in the ends of the cork to act as axles.
2. Make a U-shaped cardboard holder for it.

3. Use the craft knife to cut slits into the cork.
4. Cut pieces of card to act as fins for the turbine.
5. Place the card in the slits made in the cork.
6. Color one of the fins with the marker pen.
7. Place the cork in the holder.
8. Tape the holder in a table.
9. Use the fan on the slowest speed to create wind to blow the turbine.
10. Use the timer to count how many times the colored fin makes a complete turn in one minute. (This is called the revolution per minute (RPM) of your turbine.) Record your data in the table below.
11. Repeat steps 9 and 10 using the two additional speeds of the fan.
12. Using a new cork, repeat steps 3 to 11. This time make your own design for the fins of your turbine. (You can change the angle of the fins, or their shape or both.)

RPM of Turbine Design at Different Fan Speeds

	Fan Speed		
	Slowest	**Medium**	**Fastest**
Design 1			
Design 2			

Draw and label the picture of each design you made for your turbine on the space provided.

Guide Questions:

Answer the following questions:

1. How fast in RPMs did your turbine spin with the first design on the:
   a. slowest fan speed
   b. fastest fan speed
2. What is the difference in your turbine RPMs between the slowest and fastest fan speeds with the first design?
3. How fast in RPMs did your turbine spin with the second design on the:
   a. slowest fan speed
   b. fastest fan speed
4. What is the difference in your turbine RPMs between the slowest and fastest fan speeds with the second design?
5. Was the second design an improvement of the first? Explain.
6. In what other ways could you further improve the design of the turbine?

7. In what other ways can you make the turbine rotate aside from the wind of the fan?
8. How would you generate electricity using your turbine?

Conclusion

Concept – Connect

Ask the students the following questions:

1. How does electricity get to their house?
2. Where does electricity come from?
3. How is electricity for your area generated?
4. Is electricity generated the same way all across the country?