STANDARDS-BASED LESSON PLAN: Better version

Grade Level:8 *Subject Area(s): Physical Science* *Time:3rd Advisory Jan 29-April 15*

UNIT FOCUS: Conversation of Energy

Day ____ of ____

CONTENT STANDARD:
#3: Observe, investigate, describe, and explain the forms of energy, its transfer actions, interaction and conservation with matter.

Learning expectations for this standard appear in the state standards. They have been translated into outcomes-based language in the new lesson objectives listed below

PERFORMANCE STANDARD:
Describes and compares energy and the many forms it takes (mechanical, heat, light, sound, electrical, magnetic ,and chemical).

Describes how common forms of energy can be converted from one to another (e.g., changes between potential and kinetic energy; electrical energy to light a lamp; Construct circuits to show the flow of electrons, electrical conductivity, electrical appliances. Relates heat to energy transfer.

ESSENTIAL SKILL(S):

- Introduction/Stating the Standard and Objectives:
  - State standards above.
  - Students *will define/write* the definition of the principle of conservation of energy.
  - Students will prepare a graphical organizer listing several forms energy and how forms can be converted from one form to another, giving examples of each.
  - Students *will write* the two forms of mechanical energy forms :*gravitational potential energy* and *kinetic energy*. They will give reasons why there are losses of mechanical energy to heat (for example -due to friction). They will predict the conditions under which a person will feel lighter or heavier in a moving vehicle.

The objectives include descriptions of student products or behaviors that should result from teaching. These objectives will be the basis for evaluating students' work.

- Materials:
  - Text reading pp. 120 -127 describing conservation of energy, forms of conservation of energy and how forms can be converted from one form to another.
  - Graphical Organizer Sheet-listing one example (done in class)

- Activities:
  - Students will be expected to read the passage as homework (Physical Science, Prentice Hall.) the night before. The will construct a graphical organizer listing several forms energy. Listing examples of how these forms can be converted from one form to another, giving examples of each. During class, students will respond to questions about the reading assignment., being able to identify forms of energy and provide information on how each can be produced with an example.- in preparation for the lab (see Below)

These activities are recommended in the standards. They have been modified and organized by the teacher to elicit the outcomes in the objectives.

- Summary, Assessment, and Closing:
  Completed worksheets will be evaluated for accuracy. Students will be expected to describe forms of energy and provide information on how each can be produced with an example.

Each group should have the following:

- Tennis ball (or similar-sized ball)
- Two pieces of 70 cm × 200 cm corrugated cardboard or foam board
- Heavy-duty scissors
- Box knife
- Meterstick
- Hot glue and glue gun

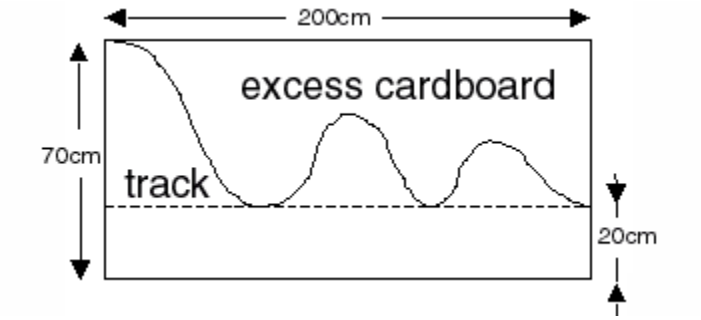
Tell students they will be designing and constructing cardboard "tennis ball" roller coasters with three hills. The tennis ball in each design must start from the top of the first hill, roll up and down the other two hills, and exit the end of the track. Each roller coaster will be judged in a class competition. The track with the greatest total of vertical heights for all three hills—if the tennis ball completes the course—will be named the winning design.

Have students consider the following when designing their roller coasters:

- Can all the hills be the same height? If not, why? Can they get bigger or must they get smaller? How will you determine how big or how small the hills can be and still win this contest?
- Does the steepness of the hill count? Is it better to make the hills steep or not so steep? Why?
- How curvy should the tops of the hills and the valleys be? Should you design sharp turns or smooth turns? Why?
- What provides resistance on the roller coaster causing the tennis ball to slow down? How can this resistance be reduced?

Note: Leave students with enough time to make revisions to their original design—an important factor in the world of design and engineering.

Divide students into small groups and give each group the materials listed earlier. The left and right roller coaster tracks will be made from the two pieces of corrugated cardboard that must be cut out as identical shapes. Each valley in the roller coaster *must* dip to a height of 20 centimeters from the bottom of the cardboard. Have students use heavy-duty scissors or a box knife to cut out both tracks. They will probably have their own ideas on how the roller coaster should be shaped, but here is an idea on how to lay out the roller coaster on the cardboard.



From the excess cardboard, students should cut out twenty-five 4 cm × 12 cm rectangles. These rectangles will serve as spacers between the two cutout tracks. Put glue along both of the 12-centimeter edges and fasten them to various places between the two tracks so that the tracks are rigid and separated by a distance of 4 centimeters.

Here is an example of how the score for a roller coaster should be calculated for the contest. Measure the heights of each of the three required hills and add them up. The roller coaster with the greatest total height of the three hills, whose tennis ball successfully completed its journey, is the winner.