Roller Coaster Design

FRAMEWORK
I. Scientific and Engineering Practices
II. Cross-Cutting Concepts
III. Physical Sciences

SKILLS/OBJECTIVES
○ Introduce potential and kinetic energy
○ Use creative design, teamwork and problem solving skills

MATERIALS
○ Pipe insulation, cut in half length-wise (roller coaster track) ○ Recyclables (serve as track supports) ○ Marbles ○ Painters tape ○ Cups (put one at end of track to catch the marble) ○ Cardstock ○ Markers
○ For all activities and demos ○ With needed amounts assuming 15-20 kids

BACKGROUND

- What is energy? Energy is…
- There are different types of energy. They include kinetic and potential energy.

Activity #1	**Roller Coaster**
Materials	○ Pipe insulation, cut in half length-wise (roller coaster track) ○ Recyclables (serve as track supports) ○ Marbles ○ Painters tape ○ Cups (put one at end of track to catch the marble) ○ Cardstock ○ Markers
Worksheet	Y

- Announce that Wesleyan is making an amusement park and that we need their help in developing a roller coaster
- To make a functioning (and fun) roller coaster they will need to understand potential and kinetic energy. Explain through demonstration (see below).
- Students should get in groups to do this project. They can pick team names if they want.
- Hand out one track, one marble, one cup and several track supports to each group. Dispense tape as necessary. Impress upon the groups that they will only get one marble, so they should keep careful track of it.
- They will practice making function roller coasters before designing the final project to be submitted to Wesleyan for consideration. The first challenge is to make a roller coaster with one hill, the second challenge is to make a rollercoaster with a loop and the third challenge is to make a rollercoaster with both a loop and hill.
- They will then use their worksheet to sketch out their proposed roller coaster, and then construct.
- If time, have them make a poster for their rollercoaster that includes the rollercoaster's name (this will be the sign out in front of the rollercoaster)
- Take pictures during the process, and final photos of each team with their final product and sign.

Activity #1	**Potential and Kinetic Energy Demonstration**
Materials	Marble
Worksheet	N

- Put marble on ground and ask if it will move. Children may respond that it will move if you push it. Then explain that nothing will happen if you don't push it because it doesn't have potential energy

- Hold marble in air and ask again if the marble will move. The children may respond that if you let go of the marble it will drop. Explain that indeed this is true. The marble in the air doesn't require the force of a push because it has potential energy due to its height.
- Explain the potential energy is stored energy – energy that is about to be used
- Explain that kinetic energy is energy in motion
- Kinetic/potential energy dance: tell them to freeze when you say 'potential' and dance when you say 'kinetic'. The reason they freeze when you say potential is because they are storing there energy and when you say 'kinetic' they will move because there displaying energy in motion.

CONCLUSIONS

Kinetic energy of an object is the energy which it possesses due to its motion. Potential energy is the energy of an object or system due to the position of the object.