STEAM Engineering Lesson: Roller Coaster Energy - Grades 6-8

Students will understand potential and kinetic energy through this hands-on experiment involving roller coaster design and building. This lesson is designed for grades 6-8, but can be adapted for younger grade levels, too.

✅ **Teacher Led**	✅ **Requires Computer OR Mobile Device**	✅ **Requires Spaces**

Spaces Prep	**Create your Activity in Spaces before the lesson. Not sure how to create an Activity? Check out this short video tutorial on assigning and managing activities.**

Learning Goals

1. Students will **understand** potential and kinetic energy.
2. Students will **design and build** a roller coaster based on their understanding of potential and kinetic energy.
3. Students will **test and make iterations** of their roller coaster.

Materials

Student Handouts	• **Handout [A] - Roller Coaster Data** for each student, partnership, or small group (page 5) • **Handout [B] - Roller Coaster Reflection** for each student, partnership, or small group (page 6)
Technology Requirements	• Mobile device, tablet, or laptop • Projector or Smartboard
Video/Audio Clips	• Our World: Kinetic and Potential Energy video from Adventure Academy • Building Roller Coasters video from Teach Engineering
Additional Materials	• Chart paper (2 pieces) and markers • Foam tube (you could also use curved cardboard, such as paper towel rolls cut in half and taped together) • Paper cups • Marbles (marbles made out of different materials are ideal, but you can also just use one type of marble and not experiment with different materials' speeds) • Tape (if using cardboard) • Stopwatch or timer (1 per student, partnership, or group) • Pencils

Instructions

Before the lesson

1. Start by asking students what they know about different types of energy.
    a. Solicit student ideas, guiding discussion so that students understand that there are different types of energy.

2. Next, tell students that while there are many different types of energy, they fall into two main categories: potential energy and kinetic energy.
    a. Show the Our World: Kinetic and Potential Energy video from Adventure Academy to further explain the differences between these two categories of energy.

3. After showing the video, have two pieces of chart paper in the room– one with “Potential Energy” written in the middle, and one with “Kinetic Energy” written in the middle.
    a. Have students use markers to do a Chalk Talk at each piece of chart paper, adding their understanding and connections about both potential and kinetic energy.

During the lesson

1. Tell students that they will use their understanding of potential and kinetic energy to design and build a roller coaster.
    a. Show the Building Roller Coasters video from Teach Engineering so that students understand how to use materials and how to make iterations of their roller coaster.

2. Have students work independently, in partners, or in small groups to design and build a roller coaster with given materials.
    a. As they finish their roller coasters, have students test their roller coaster by timing how long it takes the marble or different types of marbles to go down their roller coaster.
    b. Students should record each “run” on **Handout [A] - Roller Coaster Data** (page 4).
    c. Students should make at least two iterations of their roller coaster, testing with marbles and recording data each time.

After the lesson

1. After designing, building, and testing at least three iterations of a roller coaster, have students choose their best “run” and reflect on their design process and use of potential and kinetic energy in their roller coaster with **Handout [B] - Roller Coaster Reflection** (page 5).

Documenting in Spaces

Teacher Tip!	The instructions for this lesson involve adding to the Class or Individual Space in Spaces. You can adapt the instructions if you’d prefer to make this an Activity.

1. Students will document their learning in Spaces by following these guidelines:
    a. Click **+ Create** > Choose **Camera** > Take a photo of the completed handouts [A] & [B]
    b. Add a **Title**
    c. Post a Description > Have students answer one or more of the following prompts:
        - How did your roller coaster utilize **potential energy**? Explain with as many specific details as possible.
        - How did your roller coaster utilize **kinetic energy**? Explain with as many specific details as possible.
    d. Click ✔ **Next**
    e. Choose the **Class Space** or **Individual Space**
    f. Click ✔ **Post**

Worksheet

HANDOUT [A]: Roller Coaster Data

Name(s) _____

	Design Notes	Marble Time(s)
Roller Coaster Iteration #1		
Roller Coaster Iteration #2		
Roller Coaster Iteration #3		

Worksheet

HANDOUT [B]: Roller Coaster Reflection

Name(s) _____

Answer the reflection questions about your best roller coaster iteration's use of potential and kinetic energy.

Best Roller Coaster Iteration (circle one): #1 #2 #3

1. How did your roller coaster utilize **potential energy**? Explain with as many specific details as possible.

   _____

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   _____

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2. How did your roller coaster utilize **kinetic energy**? Explain with as many specific details as possible.

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