

Western Engineering Outreach

Marble Run Madness

Grade K-2

Meet Today's ENG HERO!



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To learn more about Dr. Ansary visit:

https://www.eng.uwo.ca/civil/faculty/el_ansary_a/index.html

Learning Goal:

- Students will be able to understand gravitational and kinetic energy.
- Students will be able to make a structure that is navigable
- Curriculum Connections: Grade 1 - Materials, Objects, and Everyday Structures; Grade 2 - Energy in our Lives

Materials Needed:

- 1 shoe box
- Several large popsicle sticks
- Glue
- Marbles and/or round beads
- Extra cardboard



Engineering and Science Connections:

Today, we will learn about different kinds of energy, but we're mainly just going to focus on kinetic and gravitational energy.

What is energy? What are some different kinds?

Energy is just the capacity to do work. This means things like moving around, jumping, and going up a set of stairs

Kinetic Energy

This kind of energy entails anything that is in motion. Running around, moving on a bike and spinning on a chair all are forms of kinetic energy.

Gravitational Potential Energy

This kind of energy increases with height. If you were to climb up some stairs, go on an airplane or go on a hot air balloon you would gain gravitational potential energy.

Conservation of Energy

Energy cannot be created or destroyed. When you climb up stairs and jump off, you turn kinetic energy into gravitational energy and back again. Energy doesn't go anywhere; you only transfer it to different kinds of energy!

Other Types of Energy

There are several types of energy. Here is a list of just a few:
Sound, thermal, electrical, elastic, radiative (light) and chemical energy.

You experience all of these kinds of energy every day and transfer one kind to another constantly! You may flick on a light switch (kinetic), which then sends a current down a wire (electrical) which finally turns on a light (radiative). This light will also give off heat (thermal) energy. This is just one example of how energy is a part of our daily lives!

Can you think of some examples too?

Video Recommendation: *Energy*

<https://www.youtube.com/watch?v=QOLBegPWzrg>

Activity:

Before beginning, think about the following questions:

- How many kinds of energy can you remember?
- Can energy transfer many times? And to multiple things? Try and think of an example to help.
- Name all the kinds of energy and energy transformations that take place in a firework!
- Identify ways your family uses energy in your home and ways you can reduce it
- How does the sun's energy allow humans to meet their basic needs? Try and write down the flow if you're stuck

Thought Experiment

What would life look like if electrical energy could no longer be used? Think about all the different activities that use this kind of energy and how you would do different tasks.

Part 1: Building your Structure

There are a few options of how you can do this activity and are all very similar and a lot of fun! You could create a maze, marble run or Plinko machine. Try and connect all the ideas you learned about energy as you play with your creation!

If you chose Marble Run: (Use Image at right for guidance)

- Collect your main materials (shoe box, popsicle sticks and marbles)
- Set your shoe box upright and make a tiny hole that a marble can fit through at the top
- Start gluing popsicle sticks inside so that the marble can "run" down the sticks like stairs going back and forth
- To play, put the marble in the hole and let it travel down the popsicle sticks

If you chose Marble Maze: (Use Image at right for guidance)

- Start by selecting a starting point where you will place your marble in the shoebox
- Set up popsicle sticks to make a path, while also making some dead ends
- To play, hold the box and lean it different ways to move the ball through your maze

If you chose Plinko: (Use Image at right for guidance)



MARBLE RUN MADNESS

- Set your shoebox upright and make a hole at the top for the marble to fit through
- Stick a bunch of popsicle sticks perpendicularly through the box to act as the posts the ball will hit
- Use some extra pieces of cardboard to make the boxes at the bottom for the ball to roll into
- To play, make predictions about which slot the ball will fall into. Then set the marble in the hole watch the magic happen!



What Did You Learn?



- What are different types of energy?
- What types of energy were used in our creations?
- List some examples of energy in our everyday life?

Future Learning



- Add more pieces to the machines
- Discuss how the ball seems to “lose” energy and entropy
- Discuss how the ball also gives off thermal and sound energy because of friction

Share your creations!

We would love to see what you made. Email as at discover@uwo.ca or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!