Lumination Learning Lab

Lesson Bytes
Teaching ideas for immersive learning

Kinetic and Potential Energy Explorers

Learning Area
Science

Year Level
Year 8

Introduction

In this lesson, students will explore the relationships between kinetic and potential energy through immersive virtual reality experiences and hands-on activities. They will investigate how energy transforms and transfers in a Rube Goldberg machine, utilizing the Gadgeteer VR app to build their own intricate chain reaction machines.

Application

Gadgeteer
Gadgeteer is a physics-based VR puzzle game where students build chain reaction machines to solve intricate puzzles. They will use gadgets to create complex chain reactions that illustrate kinetic and potential energy transformations.

Lesson Overview

Lesson Objectives

- Understand the concepts of kinetic and potential energy.
- Identify energy transfers and transformations in a Rube Goldberg machine.
- Apply knowledge by designing and creating a Rube Goldberg machine.

VR/AR Resources

- Kinetic Energy Can Recharge A ... (3:25)
- The Difference Between Kinetic ... (3:05)

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Lesson Outline

Before the Immersive Learning Journey

- Review/display the Lumination Safety Poster.pdf
- Ensure that all VR equipment (headsets, controllers, sensors) and software (applications, simulations) are properly set up and functioning.
- Review content/videos and assess their appropriateness.
- Ensure students are familiar with the app Gadgeteer, or have time to run through its inbuilt tutorial.
- Review the basic concepts of kinetic and potential energy with students.
- Discuss examples of energy transformations in everyday life.

During the Immersive Learning Journey

IMVR Station:
Students will use the Gadgeteer VR app to explore and create chain reaction machines, observing the energy transformations involved. In teams, students will rotate roles:

1. Gadgeteer - student in the VR experience
2. Identifier - student identifying points of potential and kinetic energy in experience (recorded).

HHVR Station:
Students will watch the provided VR videos to gain additional context and examples of kinetic and potential energy in real-world applications. Students use these videos to write simple definitions of kinetic and potential energy. Students may use these additional resources:

- Energy
- Potential and Kinetic Energy
- What is kinetic energy?
- What is potential energy?

Reflection and Experiment Station:
Students reflect on their VR experience/Rube Goldberg machine. Example questions could include:

1. What is potential energy, and how does it differ from kinetic energy?
2. Can you identify points in your Rube Goldberg machine where potential energy is stored?
3. Where in your machine do you see kinetic energy being used or transformed?
4. Can you describe a specific part of your machine where potential energy is converted into kinetic energy?

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5. How does friction play a role in your machine? Does it help or hinder the energy transfer?
6. Are there any points in your machine where energy is lost? If so, how can you minimise this loss?

If students are yet to complete the IMVR or creation stations, students complete the following activity. This can also be used as an extension activity.
How does friction influence the transfer of energy in your Rube Goldberg machine? Students discuss and plan an experiment investigating how different surfaces affect the efficiency of energy transfer in their Rube Goldberg machine.

Creation Station (2 options):
1) Students will design and build their own Rube Goldberg machines using physical materials. They will document the energy transformations in their designs.
2) Students design their own roller coaster and identify the points of potential and kinetic energy. If time, students could create their own paper marble roller coaster.
3) If familiar, students use CoSpace's Physics feature to create a virtual Rube Goldberg machine.

After the Immersive Learning Journey

Discuss the different energy transformations observed in the Gadgeteer VR app and the VR videos.

Discussion Questions:

1. How do the energy transformations in your Rube Goldberg machine compare to those in the Gadgeteer VR app?
2. What challenges did you encounter while designing your machine, and how did you overcome them?
3. How can the principles of kinetic and potential energy be applied in real-world engineering problems?

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