BALLOON POWERED CAR

Grade Level: 4th
Duration: 2-3 Class Periods

PROJECT DESCRIPTION

In this hands-on STEM project, students design and build balloon-powered cars, exploring motion, forces, and energy. Students learn about Newton's third law, forces, and energy principles. Following the 5E's, TN K-5 STEM Standards Framework, and the Engineering Design Process.

STEM & ACADEMIC CONCEPTS

- SCIENCE
- READING
- ENGINEERING
- MATH
- WRITING

OBJECTIVES

- Students will explore the concept of motion and energy by designing and building a balloon-powered car.
- Students will apply their knowledge of forces and motion to construct a working model of a car that is propelled by the force of air escaping from a balloon.
- Students will engage in the scientific process, including planning, designing, testing, and evaluating their car prototypes.

MATERIALS

- Balloons (assorted sizes)
- Straws
- Cardboard
- Wooden skewers
- Tape
- Scissors
- Rubber bands
- Paper clips
- Markers

STANDARDS

SCIENCE

- 4-PS3-1: Plan and conduct an investigation to determine the relationships between the properties of materials (e.g., strength, solubility, transparency, odor, texture, etc.) and how they interact with the environment.

READING

- RST4-5: Use a variety of texts and other information sources to answer questions about the natural world.

ENGINEERING

- 4.PS3.2 Observe and explain the relationship between potential energy and kinetic energy

MATH

- o4-PS3-2: Design a solution to a real-world problem by conducting an investigation and using models.
- 4-PS3-4: Communicate scientific ideas and findings by creating a presentation of findings and supporting evidence.

WRITING

- 4.W.1.1: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

VOCABULARY

- Force: Force is a push or pull that can change the motion of an object. When you push a door open, you are applying a force to it. The door will move in the direction of the force.
- Kinetic energy: Energy that makes things move! Imagine you're playing with a toy car. The faster you push it, the more energy it must zoom around.
- Motion: Motion is the change in position of an object over time. For example, a ball rolling across the floor, moving from one point to another.
- Potential energy: Potential energy is like a hidden power inside objects. It's the energy something has because of where it is or how it's set up. For example, when you hold a ball up high, it has the potential to fall and hit the ground.
- Thrust: Thrust is the force that gives things a big push forward. Just like how a balloon-powered car moves when the air rushes out of the balloon, pushing it in the right.

BALLOON POWERED CAR

ENGINEERING -MATH

Engage (Duration: 15 minutes)

- Begin by asking students if they have ever seen or played with a toy car that moves without batteries or being pushed.
- Show them a video or pictures of a balloon-powered car in action.
- Ask students to share their observations and thoughts about how they think the car works.
- Facilitate a brief class discussion on the concepts of motion, forces, and energy.

Reflection Exercise: Write a paragraph about what you already know or think you know about how a balloon-powered car moves.

Explore (Duration: 30 minutes)

- Divide students into small groups.
- Distribute the materials to each group.
- Instruct students to brainstorm and sketch their ideas for designing a balloon-powered car.
- Encourage students to discuss and consider the materials' properties and how they can be utilized to create a functional car.
- Once the designs are finalized, provide time for students to build their cars following their plans.

Reflection Exercise: Write a paragraph describing your group's design for the balloon-powered car. Explain why you chose the specific materials and how you think it will work.

Explain (Duration: 20 minutes)

- Gather the students together and invite each group to present their car designs.
- Discuss the basic principles of motion, forces, and energy transfer involved in a balloon-powered car.
- Explain how the air escaping from the balloon propels the car forward by exerting a force in the opposite direction (Newton's third law of motion).

Reflection Exercise: Write a paragraph explaining how the air escaping from the balloon propels the car forward, based on what you learned during the explanation.

Elaborate (Duration: 40 minutes)

- Instruct each group to test their car prototypes by attaching a balloon to the car and releasing the air.
- Students should measure the distance their cars travel and record the results.
- Encourage students to make modifications to their designs to improve the distance traveled or stability.
- Allow time for multiple test runs and adjustments.

Reflection Exercise: Write a paragraph reflecting on the test results of your balloon-powered car. What changes did you make? Did it affect the performance? Why or why not?

BALLOON POWERED CAR

ENGINEERING -MATH

Evaluate (Duration: 15 minutes)

- Regroup students and facilitate a class discussion about the challenges, successes, and failures encountered during the activity.
- Ask students to reflect on what they learned about motion, forces, and energy transfer through this hands-on experience.
- Provide an opportunity for students to share their observations, ask questions, and discuss their future ideas for improving their designs.

Reflection Exercise: Complete "Check for Understanding" Worksheet

Conclusion: The balloon-powered car lesson plan engages students in an exciting and interactive exploration of motion, force, and energy.

BALLOON POWERED CAR

CHECK FOR UNDERSTANDING

NAME:

1. Which type of force is used to push the balloon powered car forward?

2. What is the difference between force and motion?

3. How can kinetic energy and potential energy be used to explain the motion of the balloon powered car?

4. What could you do differently next time to make your car go faster (or go at all!)?