

Design Challenge: Balloon Car

In this challenge, students are tasked with creating a car that can be powered by a balloon! Along the way, students will learn about Newton's second law as they exercise their engineering design skills. We have provided instructions which you can use to guide your child through the design thinking process. We have also provided a step-by-step procedure for making a balloon car in case your child is struggling to come up with ideas. Feel free to rely entirely on your child's creativity, take some inspiration from our procedure, or follow our procedure exactly. This activity is aligned to the following middle school Next Generation Science Standards (NGSS): MS-PS2-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4.



What You Need:

- Science textbook or computer to research Newton's second law of motion
- Paper and pencil to write design plans
- One balloon
- Paper or plastic straws
- Scissors
- Tape
- Clay or pieces of sponge
- Four round objects for wheels (e.g., water bottle caps, CDs)
- Up to five kinds of additional household materials (e.g., plastic water bottle, empty juice carton, wooden skewers, etc.)
- Flat surface
- Tape measure

What You Do:

1. What is Newton's second law of motion? Use the internet or a science textbook to find out.
2. Your task is to design a car that can be powered by a balloon. Begin brainstorming the sorts of materials you want to use and why. There are constraints to your design:
 - You may use one balloon, straws, tape or glue, clay or pieces of sponge, and four round objects for wheels.
 - You may include no more than five additional types of household materials in your design. Try to choose inexpensive, recyclable materials.
3. How might your car be structured? Create several different design plans for your car through drawings, diagrams, and/or detailed descriptions. Your design plan should be so thorough that if you sent it to a friend, they could create your car perfectly without having to ask questions.
4. Choose one of your design plans and construct your car.
5. Time to put your car to the test! Let your car run on a flat surface and measure the distance it travels with a tape measure.
6. Analyze your results. Did your car travel as far as you thought it would? What forces acted on your car as it traveled? Would you change anything about your car to make it travel farther if you were to redesign it?
7. Modify your car using a different design plan, and then repeat the experiment. Did this design perform better or worse than your first design? Why do you think that is?

Here is a procedure for creating a balloon car if you're struggling to come up with a design. Feel free to modify this design to make it your own!

1. Choose a water bottle, juice box, or other similarly sized object to serve as the body of your car. Make sure the object is clean and dry.
2. Cut two pieces of straw that are the same width as the body of your car.
3. Tape the straws to the bottom of the body of the car, about half an inch away from the top and bottom edges.
4. Cut the pointy ends off a wooden skewer, and then cut it into two pieces so that each piece is about an inch wider than the body of the car.
5. Slide the skewers into the straws that you taped onto the bottom of the car.
6. Fill four bottle caps with clay or pieces of sponge. Press them onto the skewers. These will serve as the wheels of your car.
7. Push a straw about two inches into a balloon. Secure the balloon to the straw with a piece of tape. Make sure that there are no gaps.
8. Tape the straw with the balloon to the top of your car. Part of the balloon should be hanging over one end of the car, and part of the straw should be sticking out over the other end.
9. Test your car. Place the car on a smooth, flat surface, blow some air into the balloon through the straw, then let go and watch your car race away!

Author: Rachel Walter

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