



Junior Mechanical Engineering: Balloon Car Design Challenge Badge

Pillar: STEM

Outcomes: Develop a strong sense of self

Design and build, balloon-powered cars in this fun lesson plan that teaches about engineering design and kinetic and potential energy.

Juniors will earn their badge by:

1. Learn about potential and kinetic energy.

- Make a pinwheel using a push pin or paperclip and paper or card stock. Learn about air power. What are three things around your house that interact with air power?
- What is potential energy?
- What is Kinetic energy?

2. Design and build a balloon car

- What's the design plan for your prototype of a car powered by a balloon?
 - Brainstorm 3-4 ideas for each topic and gather your materials.
 - Material for your body:
 1. Axle (2)
 2. Wheels (4)
 3. Connection material
- Write ideas or draw plans for your design on a piece of paper.
- Build your car.

3. Test your balloon-powered car

- Test your balloon powered car. Find a flat surface in your house and mark a beginning and an end with tape or a string. Use a stopwatch to see how fast and how far your car goes.
- Make notes as to how your car performed. If your car doesn't work the way you expect it to, that's not bad. It's an opportunity to solve a problem and make a better prototype.

4. Analyze and share your results

- Why did your car perform the way it did?
- Does your car veer off to one side? Check if your axles are parallel to the floor or if they are at an angle. Check if your wheels are centered on the axles
- How could you make your design even faster?
- How could you make it go further?
- Write three to four ideas and share with your siblings or parents.

5. Brainstorm ways to improve your design

- Engineers use their test results and analysis to guide how they will improve their prototypes. Based on what they learned from testing, they think of possible improvements. Write ideas or draw plans to improve your design here. Use extra paper if you need to! **Make changes to your car and test it again.** That's what engineers do: they design, test, improve, and test again, over and over, until they come up with a product that works the way they need it to.
- What changes did you make? Did it work?

Online additional resource:

- **Resource 1:** This video explains jet propulsion, potential and kinetic energy, and shows how balloon-powered cars are built. <http://pbskids.org/designsquad/build/4-wheel-balloon-car/>
- **Resource 2.** Design Thinking Process:

- Identify the Problem
- Brainstorm & Plan
- Build
- Test
- Analyze Results and Improve
- Share Your Solution

When you're finished: Congratulations, you have earned your badge! You can purchase by emailing shopdept@gksmo.org or at <https://www.girlscoutshop.com/Junior-Balloon-Car-Design-Challenge-Badge>

No shipping charges apply at this time.

