

Lesson: [Let's Build a Parachute](#)

Grade Level: 6-8 – Time Required: 50 minutes.

Subject Areas:

- Science
- Technology
- Physical Science

[Acknowledgments](#)

I would like to acknowledge that this activity was inspired by the following lesson found at Teachingengineering.com: [Design a Parachute](#). Special acknowledgement to the University of Colorado and Worcester Polytechnic Institute for the design of this original lesson.

[Summary](#)

Students will learn about the use, science, and engineering behind the creation of a parachute applying physics concepts. They will create their own parachutes using different materials available. They will have the freedom to choose what items they will use for their parachutes to work best. Students will also test their designs and participate in a class discussion to determine which paper material worked best in this project.

[Engineering Connection](#)

Engineers use physics and science in general to build things. In this case, parachutes use concepts of aerodynamics and fluid flow, just like it is used to design and build planes, cars and ships. Drag is an important force to be considered when a parachute is designed. Engineers must iterate their designs to get the best results.

[Learning Objectives](#)

After this lesson, students should be able to:

- Use techniques to design a parachute that falls as slow as possible.
- Differentiate different kind of materials to get the best result by determining the best choice based on test.
- Understand forces concepts such as drag and understand how air resistance is important in flights.
- Explain and list the steps of the Engineering Design Process.
- Identify and analyze possible solutions to a problem.

[Educational Standards](#)

- International Technology and Engineering Educators Association – Technology
 - [Students will develop an understanding of the attributes of design.](#) (Grades K-12)

- [Illustrate how systems thinking involves considering relationships between every part, as well as how the system interacts with the environment in which it is used.](#)
(Grade 6-8)
- [SC.6.P.13.2](#)
 - Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.
- [MS-ETS1-4](#)
 - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
(Grades 6 - 8)

Materials

- Tissue Paper
- Napkins
- Construction Paper
- Newspaper
- Paper Towels
- String
- Tape (any kind)
- Washers
- Measuring tape
- Ruler
- Stopwatch (phone can be used)

Lesson Background

In order to ensure that students can easily understand this lesson, it is crucial to explain what a parachute is (in simple terms) and its purpose. To make the explanation more engaging, some recommended sources can be shared. For instance, this [webpage](#) can be used to illustrate the definition of free fall and air resistance. Moreover, it is important to help students remember the Engineering Design Process steps, which include defining the problem, identifying constraints and limitations, brainstorming solutions, selecting the best options, prototyping their solution, testing and evaluating, iterating and communicating their solution.

Introduction

Why do people use parachutes? What sports require parachutes? If you must jump from a plane when you are up in the sky, what kind of parachute would you use? What would the perfect parachute look like for you? Would you like it to be big? What material do you think would be best?

In engineering, the design process is truly important. When it comes to parachutes, designing it is extremely important, even more important if it is going to be used in an extreme sport because a

person's life depends on it working properly. That is why engineers test the materials they want to use and the designs to make sure that everything about it works perfectly: how fast it opens, how reliable it is, how much it can withstand in the air, how resistant it is. Today we will take on the role of an engineer and will have to test and design our own parachutes using simple materials.

Procedure

Before the Activity

- Gather materials with the students.
- Start a discussion related to the topic. Ask what a parachute is and how it works.
- Have teams brainstorm characteristics of a parachutes, materials, designs. Have them write down their ideas or you can write them on the board and have them draw their possible sketches.

Part 1: Design and Construction

1. Have students discuss in their groups their possible models.
2. Monitor what they are doing and help students if they have any kind of questions.
3. Have students start their construction.
4. Give students time to build their prototypes and then ask them to test it.
5. Go to a place where the wind blows and drop it from a specific height to see how slow and well it works (it should land as gently as possible).
6. Ask students to record the time and other notes/comments they can see.
7. If time allows, give them time to iterate and modify their parachutes. Ask students what modifications they would make and what things they think worked well.
8. Test the new version of the parachutes and record new data.
9. Compare the results with the whole class and star a discussion to draw conclusions.

Construction Tips:

1. Cut a circle from the selected material. Students can choose their own dimensions, or you can provide them with a specified area.
2. Cut a hole in the center of the shape.
3. Cut six pieces of equal length string and tape them to the material selected (try to tape them at a symmetric distance around the edges).
4. Tape the other side of the string to a weight (you can choose what the weight is).

Differentiation/Accommodations

If students are having trouble cutting their materials, the teacher can provide assistance. When explaining the concept of a parachute and how it functions, it's helpful to use visual aids such as pictures or videos to ensure complete understanding. Linked below are a few videos that could be helpful:

- <https://www.youtube.com/watch?v=tofBRpzB5n4> (How does a parachute work?)
- <https://www.youtube.com/watch?v=bFOqulAxKb0> (Drag Resistance)

- https://youtu.be/ElpqPZd1RJU?si=ma20jVj74t_Q8NvV (Air resistance)
- <https://youtu.be/Z0eJBtAnUxY?si=LXIZCgd4exJ7vAsU> (How to Reduce Air Resistance)

As per the teacher's guidance, students will be given the choice to express their final conclusions in a range of creative formats, such as poetry, artwork, or any other suitable format they wish to choose. This approach aims to provide a more engaging and personalized learning experience to the students, where they can showcase their creative abilities in addition to displaying their understanding of the subject matter. We believe that this approach will enable students to better reflect on their learnings and convey their conclusions in a more effective and engaging manner.

We can provide students with prompts to help them start their points of view and statements. Some examples of prompts are:

- "A question I have about [concept] is..."
- "In my opinion, the most important aspect of [concept] is..."
- "I believe [concept] is relevant to our lives because..."
- "I think the best way to do this is..."
- "If I could, I would change my design by..."

Vocabulary/Definitions

Brainstorm - A group discussion to generate ideas or to solve problems.

Prototype - A first, typical, or preliminary model of something, especially a machine, from which other forms are developed or copied.

Design: To form a plan.

Assessment

You can assess this activity at the end by having students calculate the area of the parachute by using the formula ($A = \pi r^2$). You can also ask them to create a graph showing area vs. drop time. Then, as a class, discuss how the area of the parachute affects its flight. Have students share their ideas and come up with a conclusion (the bigger the area, the slower the parachute will land).

References

Dictionary.com. Lexico Publishing Group, LLC.. (Source of most vocabulary definitions, most of which were done in my own words) <http://www.dictionary.com>

CPALMS Standards and Achievement Standards Network (Source of educational standards)

<https://www.cpalms.org/Public/search/Standard>

<http://asn.jesandco.org/resources/ASNJurisdiction>

Contributors

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