

Courageous Canopy

Objectives:

- Students will demonstrate creativity in designing unique parachute designs and innovative solutions to ensure a safe landing for Jack and Jill.
- Students will work in teams to brainstorm ideas, share resources, and communicate effectively to achieve common goals.

Activity that involves problem-solving and strategic thinking:

- Students will use a variety of materials to design and build a parachute.

Standards/Objectives addressed:

Next Generation Science Standards (NGSS):

- K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Common Core State Standards (CCSS):

- CCSS.MATH.CONTENT.K.G.A.2: Correctly name shapes regardless of their orientations or overall size.
- CCSS.MATH.CONTENT.K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

Background knowledge needed:

- **Basic Principles of Aerodynamics:**
 - Understanding how air resistance, drag, and gravity affect the descent of an object like a parachute.
- **Shapes and Structures:**
 - Knowledge of different shapes and their properties to design an effective parachute that can slow down the fall of Jack and Jill.
- **Materials and Textiles:**
 - Familiarity with various materials (such as fabric, paper, plastic) and their characteristics to select the most suitable material for the parachute.
- **Measurement and Data Analysis:**
 - Ability to measure and record data accurately during parachute tests and analyze the results to make informed design decisions.

- **Safety Precautions:**
 - Understanding basic safety principles when testing parachutes, including proper handling of materials and conducting experiments in a controlled environment.
- **Problem-Solving Skills:**
 - Capacity to think critically, identify challenges in parachute design, and devise creative solutions to address them.
- **Teamwork and Collaboration:**
 - Skills in working collaboratively with peers, sharing ideas, and contributing to a collective goal of designing a successful parachute for Jack and Jill.

Materials:

- **Fabric:** Lightweight fabrics such as nylon, silk, or polyester can be used to create the main canopy of the parachute. These materials provide durability and good air resistance.
- **String or Yarn:** Strong string or yarn can be used for attaching the canopy to the parachute harness and suspension lines.
- **Plastic Bags:** Thin plastic bags can be repurposed to create a lightweight canopy for the parachute. They offer flexibility and can catch air effectively.
- **Paper:** Lightweight paper, like tissue paper or construction paper, can be used to construct a simple parachute canopy. It is easy to work with and can be decorated.
- **Scissors:** Essential for cutting the materials to the desired shapes and sizes.
- **Tape or Glue:** Adhesives can be used to secure the materials together when assembling the parachute.
- **Ruler:** Useful for measuring and ensuring the dimensions of the parachute components are accurate.
- **Weights:** Small weights or objects can be attached to the parachute to simulate the weight of Jack and Jill during testing.

Prompts – questions or statements to elicit engagement

- "Imagine you have unlimited access to materials. What other items or resources could you incorporate into your parachute design to make it stand out?"
- "How can we make our parachutes more colorful and visually appealing? What materials could we use for decoration?"
- "Consider different textures and properties. What materials could add interesting textures or features to your parachute design?"
- "Are there any unconventional materials you think might work well for specific parts of the parachute, such as the canopy or suspension lines?"
- "Think about the environment where Jack and Jill will land. What materials could enhance the safety or functionality of the parachute in that setting?"

- "How can we incorporate recycled or upcycled materials into our parachute design to promote sustainability?"

Vocabulary

- **Parachute:** A device used to slow the descent of an object through the air by creating drag.
- **Aerodynamics:** The study of how air moves around objects and the forces that affect objects in motion through the air.
- **Drag:** The resistance encountered by an object moving through the air, which slows its forward motion.
- **Canopy:** The fabric portion of the parachute that catches the air and slows the descent.
- **Suspension Lines:** The lines that connect the canopy of the parachute to the harness or payload.
- **Deployment:** The process of releasing and opening the parachute during descent.
- **Terminal Velocity:** The maximum speed an object reaches when falling through the air, where the force of gravity is balanced by air resistance.
- **Payload:** The weight or object the parachute is designed to carry and safely land.
- **Prototype:** A first or preliminary model of something, such as a parachute design, used for testing and evaluation.
- **Iteration:** The process of repeating a sequence of steps in order to improve and refine a design or solution.

Reflection prompts

- **What was your initial design idea for the parachute, and how did it evolve throughout the testing process?**
- **Describe a challenge you encountered during the parachute design activity. How did you approach solving this challenge?**
- **What were the most successful aspects of your parachute design? Why do you think those elements were effective?**
- **Reflect on the testing phase of the parachutes. What data did you collect, and how did you use that data to improve your design?**
- **Discuss the importance of teamwork during this activity. How did working with your peers contribute to the success of your parachute design?**
- **In what ways did your understanding of aerodynamics and forces in motion influence your design decisions for the parachute?**
- **Identify one thing you would do differently if you were to redesign your parachute. What lessons did you learn from the testing phase?**

- **How did your parachute design reflect creativity and innovation? What unique features did you incorporate into your design?**
- **Consider the environmental impact of your parachute materials. How could you make your design more sustainable in future iterations?**
- **Reflect on the overall experience of the parachute design challenge. What new skills or knowledge did you gain, and how might you apply them in future STEAM projects?**