

LESSON PLAN: Weight Distribution and Flight



Description:

During this ELA focused lesson, students conduct weight distribution experiments with paper airplanes in order to get information to share in a short presentation.

Grade Levels:
4-8

The Tech Challenge Connections:

- This activity connects with 2019 Tech Challenge in that it uses a basic paper airplane for students to experiment with weight distribution and quickly iterate designs. There are many differences between hovercraft and airplane behavior in regards to weight distribution, but experimenting with airplanes allows for rapid prototyping and observation- key practices for optimizing performance and skill. Weight distribution will also affect the performance of hovercraft designs.
- One portion of the Tech Challenge is the interview with the judges. To prepare students for the interview, this lesson has them practice developing short, succinct presentations with key points. They should also practice more informal interviewee skills like choosing style for an audience and responding conversationally to impromptu questions.

Objectives:

Students will

- Understand that balance and weight can impact the performance of a device.
- Create clear explanations based on their observations.
- Practice blending informal and formal presentation techniques.

Duration:
107 minutes
or two
60-minute
classes

Standards Connections:

[CA CCSS ELA: Speaking & Listening](#)

Grade 6 4.a.

- Plan and deliver an informative/ explanatory presentation that: develops a topic with relevant facts, definitions, and concrete details; uses appropriate transitions to clarify relationships; uses precise language and domain specific vocabulary; and provides a strong conclusion.

Materials:

Paper airplanes

- Paper
- (optional) Tape

Weights

- 5 boxes of paper clips
- Pennies and cellophane tape
- Masking tape

Prep:

Making a model paper airplane

- Choose a model of airplane you want to use and practice making it yourself. Or look at designs online with your class and pick a new favorite to make together. The type of paper airplane is not significant to this challenge, so teach students your favorite method or try a new one. It will be most beneficial for comparison to have everyone make the same style of paper airplane.

This lesson is part of:
The Tech Challenge Presented by Dell

For more information visit:
thetech.org/thetechchallenge



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Extensions:

- Create a full technological presentation to document all of their experiments and what they learned.
- Have students experiment with different airplane designs and see if weight distribution affects flight in the same ways across different paper airplane models.

Lesson:

1. Introduce the topic of flight and balance (3 minutes).
 - a. *Raise your hand if you have ever flown on an airplane or helicopter before?*
 - b. *Before a flight takes off often the flight attendants check a list of passengers or walk down the aisles counting passengers. Does anyone know why they might do this?*
(Actual Reason: to calculate weight and distribution on the airplane.)
 - c. *Today we are going to see why weight and weight distribution on a plane matters by conducting our own experiments with paper airplanes.*
 - d. *As we get ready to design hovercrafts for the 2018/19 Tech Challenge it is important to think about ways weight can be distributed and imagine different ways to test this in order to optimize the performance of our devices.*
2. Demonstrate how to make a paper airplane and have each student make their own. For more information on this see the **Prep Section** at the beginning of this lesson (10 minutes).
 - a. As a class discuss different ways we could test weight and weight distribution on a paper plane.
(Attaching paper clips, tape, pennies, or other small objects on different locations on the planes via the nose, tail, wings, or body of the paper airplane.)
 - b. *What is your hypothesis if we add weight to one or two locations on the paper airplane? What happens if the weight is the same or if we use different amounts of weight in different places?*
3. Pair up students and give them time to modify and manipulate their paper airplanes with weight. Encourage them to try different ideas, talk over what they observe, and record their findings. Observe students as they work and ask facilitative questions (15 minutes).
 - a. *How does the plane perform differently with with weight there?*
 - b. *What do you think would happen if you changed the amount of weight that you put there?*
 - c. *Is the airplane's performance consistent with your hypothesis?*



4. Have student pairs develop and practice a presentation about their paper airplanes together (30 minutes).

Share your team's top two favorite designs with the classroom

Presentation Content should include:

- Demonstrate the team's top two favorite paper airplane weight configurations (teammates cannot use the same configuration).
- Explain why you chose this configuration.
- Provide a hypothesis for why you think this weight pattern caused this effect on the airplane.
- Each student should talk between 45 seconds and 1 minute 15 seconds.

Presentation Performance should include:

- Informal, conversational tone.
- Specific details shared concisely so presentation fits within 2 minutes.
- Appropriate volume (so everyone can hear you).
- Appropriate eye contact (look around the room and talk to different members of the audience).
- A paper airplane used as a prop to help illustrate your ideas.

Time: 4 minutes to present per team.

- Each student gets 1 minutes to present.
- Each student gets 1 minute to answer a teacher or classmate question(s).

Presentation Question Bank:

- Tell me about the source of your ideas.
- Tell me about how you worked as a team. (picking your designs to share, developing your presentations, practicing for the class presentation)
- How would your design work in real life?
- Tell me about your failures.

5. Have student teams demonstrate for the class (60 minutes for a class of 30 students).
- a. Ask students in the audience to listen to the content of the speeches.
 - b. Ask students in the audience to record things they liked about different student presentation styles. (What they observed that made it easy to listen or follow along with a presentation.)
6. Debrief the activity with the class:
- a. *What things did speakers do that you particularly liked?*
 - b. *What was challenging in doing this presentation?*
 - c. *If you had more time, what would you change about your presentation?*
 - d. *How would you document the information from your presentation in your journal where people aren't able to ask you clarifying questions?*