

Math with Gliders

Students will use mathematical applications while they work in teams to learn about the basics of flight and its components by constructing and flying a variety of gliders.

LESSON PLAN

Learning Objectives:

The students will:

- Follow directions to construct four different paper gliders
- Predict how far the gliders will fly
- Measure actual distances flown by each glider
- Calculate average distance flown by each glider
- Make a double bar graph and line graph

Purpose:

Working in teams, students will construct four different paper gliders. After constructing the gliders, the students will estimate the distance they think the gliders will fly. Students will fly the gliders and calculate the average distance flown. Next, the students will modify the weight of the gliders using paper clips and again fly the four gliders and calculate average distances flown. They will record the distances flown, make a double bar graph and a line graph, and compare the two flights of each glider.

Introduction:

Flying objects have been around for centuries, but gliders are an invention that helped pioneer the invention of the airplane. The first successful, wing-born flight occurred in 1849 based off a scientific glider design by George Cayley. After these first few tests, numerous engineers and developers started to work on gliders. The most notable developers being the Wright brothers. In the years from 1900 – 1902, the Wright brothers tested, studied and conducted several glider experiments as steps towards their goal of creating a true flying machine. On December 17, 1903, the Wright brothers successfully flew the world's first, heavier-than-air, powered aircraft. Gliders continued to be used for airplane development and research. And gliders were also used for supply and transportation. Gliders are now mostly recreational aircraft.

Grade Level: 5 – 6

[Ohio Learning Standards/Science \(2018\)](#)

Expectation of Learning:

[Nature of Science](#)

Ohio's Cognitive Demand for Science:

[Demonstrating Scientific Knowledge](#)

[Interpreting and Communicating Science Concepts](#)

[Ohio Learning Standards/Mathematics \(2017\)](#)

Numbers & Operations:

[5.NBT.7](#): Solve problems by adding, subtracting, multiplying and dividing

Measurement & Data:

[5.MD.1](#): Know U.S. customary measurement units

[5.MD.2](#): Display and Interpret data in graphs

Statistics & Probability:

[6.SP.4](#): Display numerical data in plots

[6.SP.5.c](#): Find quantitative measure of center (median and/or mean)

Materials Required:

- Paper (for gliders)
- One set of three patterns (**refer to Resources** for examples)
- Balsa wood glider
- Pencils
- Glue
- Measuring tape with metric units and/or meter sticks
- Paper clips

Procedure:

A. Warm-up

1. Give a brief lesson on the introduction and on information from the resources sections.
2. Review how to correctly measure distance using a metric tape measure/meter stick.
3. Review how to calculate mathematical mean.
4. Review how to complete a bar and line graph.
5. Discuss three different paper glider patterns to copy (SEE Resources Section) and give a balsa wood glider to each group of students.

B. Activity

1. Divide class into groups of four students. Give each group instructions on how to make each of the four gliders. Each group should have three paper based gliders and one balsa wood glider.
2. Take as much time as needed to complete the construction of all four gliders.
3. Fly the gliders in a large open indoor area (such as the gymnasium). Make several practice flights before you start to record data so you get the feel of how to throw the gliders properly.
4. Each team will estimate how far they think each of the gliders will fly. Record estimation.
5. Now fly each glider four times. Measure distances flown and record.
6. Calculate the average distance flown by each of the four gliders. Record.
7. Give each group some paper clips and allow them to modify the gliders by adding mass (paper clips) to the gliders.
8. Fly the modified gliders four times each. Measure distances flown. Record.
9. Calculate the average distance flown by each of the four modified gliders. Record.

C. Wrap-up

1. Each group will make a double bar graph (example shown on next page) to represent the average distance flown by each glider during the first flight and the second (modified) flight.
2. Each group will plot a line graph displaying each test by the distance flown. The lines within each chart will be marked as the specific glider tested.
3. Make inferences as to why one glider might fly farther than another. Put your description underneath the graphs.

Assessment/Evaluation:

Students will be assessed on their ability to follow directions, measure accurately, calculate averages correctly, make bar and line graphs, and work cooperatively as a team.

Extension:

1. Decorate gliders using crayons, markers, or colored pencils. Research World War II aircraft and decorate gliders to represent one of the planes.
2. Repeat the lesson using standard units when recording flight distances. Or convert recorded units.
3. Research significant historical figures and events related to gliders. Write a report.
4. Write an editorial of the first manned glider flight.

Resources/References:

Paper Glider Patterns/Instructions:

<https://origami.wonderhowto.com/how-to/fold-record-setting-glider-style-paper-airplane-guinness-world-records-407548/>

<https://paperplannedepot.com/bullnose-glider/>

<https://youtu.be/7vEU3rO0PuQ>

History of Gliders:

https://www.softschools.com/inventions/history/gliders_history/203/

<https://airandspace.si.edu/exhibitions/wright-brothers/online/fly/1903/#:~:text=On%20December%2017%2C%201903%2C%20Wilbur,invented%20the%20first%20successful%20airplane.>

<https://www.dkfindout.com/us/transportation/history-aircraft/early-glidern/>

<https://www.britannica.com/technology/glider-aircraft>

<https://www.grc.nasa.gov/WWW/K-12/airplane/glider.html>