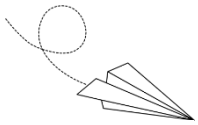
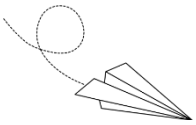


Airplane Challenge



Developed by:
Kelly Villar

Discipline / Subject:
Science/ STEM/Math

Topic:
Design and build a paper airplane for a specific purpose.

Grade Level:
Upper Elementary

Resources / References / Materials Teacher Needs:

1. Planning sheets
2. Paper 8 ½ by 11 inches
3. Kids' Paper Airplane Book by Ken Blackburn,
4. Ultimate Paper Airplanes for Kids by Andrew Dewer
5. https://www.grc.nasa.gov/WWW/K-12/UEET/StudentSite/dynamicsofflight.html#forces
6. Scissors, tape, paperclips
7. Rulers, yardsticks, tape measures

Lesson Summary:
Students will plan and create a paper airplane. The students must create a plane that will fly the greatest distance.

Standards Addressed: (Local, State, or National)

1. 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, and cost.
2. 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how ell each is likely to meet the criteria and constraints of the problem
3. 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects so a model or prototype that can be improved.
4. CCSS.MATH.CONTENT.3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.
5. CCSS.MATH.CONTENT.4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
6. CCSS.MATH.CONTENT.5.MD.A.1Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Learning Objectives:

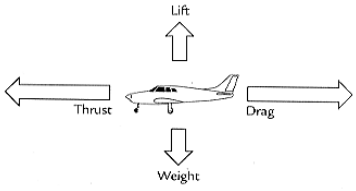
1. Students will design a paper airplane, test flight, and make modifications accordingly.
2. Students will measure the flight distances in feet and inches.
3. Students will record and analyze data collected.
4. Students will identify drag, lift, thrust, and weight and how it impacts flight.

Assessment:

Record sheet

Procedural Activities

1. Introduce the activity for today and the key vocabulary
   - Drag
   - Thrust
   - Lift
   - Weight



Use the following website to help discuss the key vocabulary and how they have an

impact on flight https://www.grc.nasa.gov/WWW/K-12/UEET/StudentSite/dynamicsofflight.html#forces
Using the key vocabulary discuss how the size, shape, weight, angle of release etc… of their planes can affect flight.

2. Pass out the planning sheets for designing and building a paper airplane. Students will be expected to build a paper airplane that will travel the farthest distance.
3. Give the students about 30-40 minutes to create their planes, test, and make modifications. The students should complete and record the measurements for each test. Modifications to their aircraft should be made between tests.
4. Using the record sheet have the students record the distance of each test in inches and in feet. Using their data student will find the mean, median, mode, and range of their data. Share the data gathered, and modifications made between test flights.

Materials Students Need:

Students will need:

1. Planning sheet
2. Paper
3. Scissors
4. Tape
5. Paper clips
6. Access to several paper airplane texts
7. Rulers, yard sticks, tape measure

Technology Utilized to Enhance Learning:

1. https://www.grc.nasa.gov/WWW/K-12/UEET/StudentSite/dynamicsofflight.html#forces

Other Information:

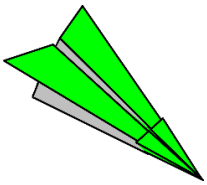
Modifications for Special Learners/ Enrichment Opportunities:

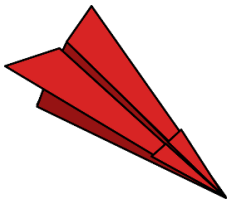
Modifications

1. Use paper that has folds preprinted.

Enrichment:

1. Have the students create a plane that will carry weight. Use washers and coins to add weight to the paper airplane.



Airplane Challenge!

Names:_____

Directions: Create a paper airplane that will travel the farthest distance.
Draw your design here and label your materials:
Modifications made to the paper airplane and new designs:

Name_____

Tests	Distance in inches:	Distance in feet:	Data:
Test 1			Mean:
Test 2			Median:
Test 3			Mode:
Test 4			Range:

What factors may have affected your data (wind, type of plane, etc…)?

_____
_____
_____
_____
_____

What modifications did you make to your plane? How did they help? What new modifications would you make?

_____
_____
_____
_____
_____
_____
_____
_____
_____