Testing

Paper Airplane Fun in Class!

Have you ever flown a paper airplane?

Have you ever flown a paper airplane as part of an assignment in class?!

Check out these designs from a professional paper airplane designer!

Brainstorm!

Think about…

- What makes a paper airplane go as far as possible?
- What could limit a paper airplane's flight?
- How can we test the success of paper airplanes?

Now find your own research on paper airplane design!

"I Can" Statements

I can...

- use research to compare best design features.
- evaluate how to modify my airplane design and materials based on testing.
- explain why testing is important in the invention process.
- determine how I will test my prototype and plan out my procedure for testing.

Today you will:

- determine what design features make a paper airplane fly successfully.
- design paper airplanes and test their success.
- modify designs based on test results.
- begin to plan the testing of your own invention!

Complete the Research Worksheet

Now that you've completed your paper airplane research, discuss what you learned with your groups. Fill out your Research Worksheet!

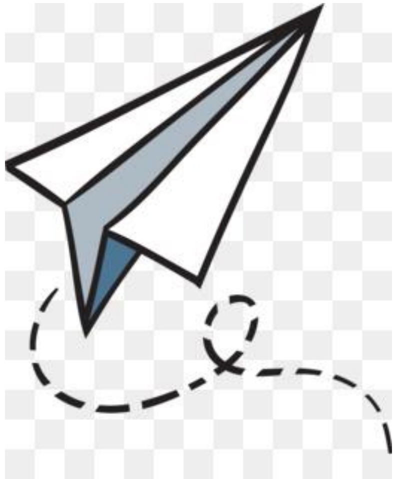
What design features led to successful flights?

What design features led to unsuccessful flights?

As a group, decide what features your first plane should have!
Gather the supplies you will need now!

Folding Time! – First Design

Using what you have learned about paper airplanes, fold your first flight prototype!



Testing [redacted]

It’s Almost Data Collection Time… But First, Let’s Talk!

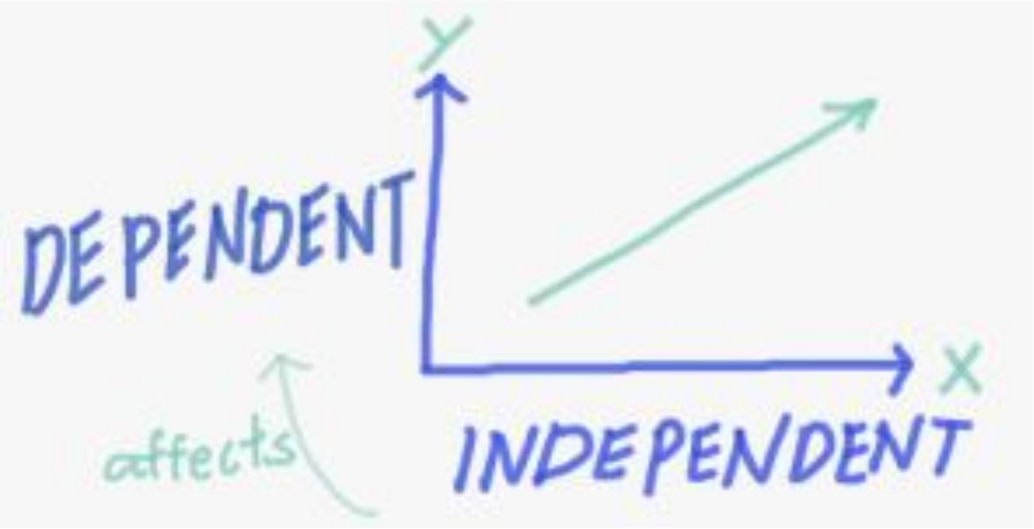
Now that we have our first prototypes, let’s talk about what we’re looking for.

- How will we know which planes are successful?
- How will we measure the planes’ success?
- What is data? How is it measured?
- Are observations data?
- How can we organize data?
- How can we turn data into a visual?

[redacted]

Data Collection Step 1: Design Your Test

- You can only test one variable at a time.
- What your group chooses to test is called the independent variable.
- Variables you can test that might affect the flight of your plane include:
    - How you throw the plane
    - Plane materials
    - Wing shape
    - Tail or no tail
    - What else can you think of?



https://www.expii.com/t/dependent-independent-variables-4337

Key Question:
How many variables can you test at a time?

Data Collection Step 2: Set Up Your Data Collection Documents

- Did you decide to collect qualitative data or quantitative data?
- Choose the first independent variable you'll test and set up your data table.
- The independent variable always goes in the first column on a table!

Example Data Table

Type of Paper Material	Distance it flies (meters)
Construction paper	3.5
Printer paper	4.2
Newspaper	

Qualitative Data

No Numbers!

Opinions

Colors

Favorites

Observations
Ex. Fast or slow

Quantitative Data

Numbers & Measurements!

Weight

Density

Height

Volume

Step 3: Test Your Design & Collect Your Data

Now that you have your tables set up, begin your testing!

Keep your data organized and take lots of notes!

Key Question:
Why is it important to take good notes about your experiment?

The unsung heroes of the Wright Brother's first flight tests.

https://www.cartoonstock.com/directory/t/test_pilot.asp

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Step 4: Analyze Your Data & Create Graphs

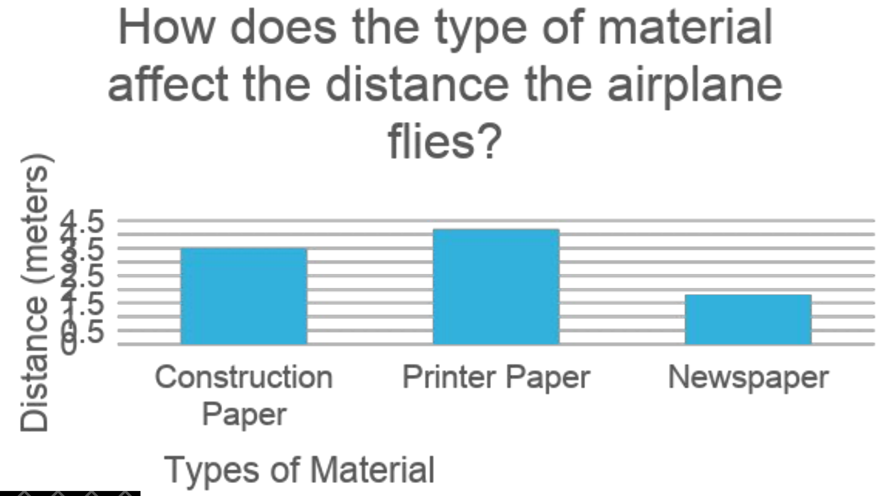
You have finished collecting data!

- Create a graph to analyze how the changes you made affected the flight of your paper airplane.
- Which changes did you make that you should you keep in your design? Which changes didn't work as well?
- Decisions you make for the next design should be supported by the results of your data!

Mock data set

Type of Paper Material	Distance it flies (meters)
Construction paper	3.5
Printer paper	4.2
Newspaper	1.8

Mock data set turned into a graph



Testing

Paper Airplane Fun in Class! – Research Worksheet

Directions:

In your groups, research information about paper airplanes. It would be helpful to research designs, materials, and possibly examples of the best ways to test your design.

Research:

Paper Airplane Research Item	Source	Important Information
Designs of Paper Airplanes		
Types of Material		
Methods of Testing Paper Airplanes		

Reflection Questions:

What design features do you think you should use in your initial prototype? Why?

1. ______________________________

2. ______________________________

3. ______________________________

4. ______________________________

Drawing of your first prototype:

Once you have your first prototype designed, your group may begin to gather your materials and build!

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Testing

Paper Airplane Fun in Class! – Data Collection Worksheet

Directions:

In your groups, you will determine the best method to test and collect data for your prototypes. Below are blank tables you can use for your tests, or you can design your own on the back. Create graphs of your data using graph paper, a computer program, or the back of this paper.

Data Collection:

Example Data Set-up:

Characteristic being tested: Wing Length

Characteristic Tested: Wing Length	Trial 1 (m)	Trial 2 (m)	Trial 3 (m)	Average
Short Wings	**2**	**2**	**3**	**2.3 meters**
Medium Wings	**4**	**3**	**3**	**3.3 meters**
Long Wings	**5**	**6**	**4**	**5 meters**

Round 1 of testing

Characteristic being tested: ______________________________

Characteristic 1 Tested:	Trial 1	Trial 2	Trial 3	Average

Qualitative Data Collection Space (observations - data without numbers)

Graph **Title:** ____

0

Note: You may also use the back of this paper and extra blank sheets to create your own graphs!

Analyzing Your Results!

What trial did the best? Why?

What trial did the worst? Why?

Which design of the characteristic will you add to your prototype and why?

Draw a design of your new prototype below, gather materials, and build it for the next round of testing!

Round 2 of testing

Characteristic being tested: ____

Characteristic 2 Tested:	Trial 1	Trial 2	Trial 3	Average

Qualitative Data Collection Space (observations - data without numbers)

INVENTION CONVENTION CURRICULUM

Graph **Title:** ______________________________

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Note: You may also use the back of this paper and extra blank sheets to create your own graphs!

Analyzing Your Results!

What trial did the best? Why?

What trial did the worst? Why?

Which design of the characteristic will you add to your prototype and why?

Draw a design of your new prototype below, gather materials, and build it for the next round of testing!

Round 3 of testing

Characteristic being tested: ____

Characteristic 3 Tested:	Trial 1	Trial 2	Trial 3	Average

Qualitative Data Collection Space (observations - data without numbers)

Graph **Title:** ______________________________________

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Note: You may also use the back of this paper and extra blank sheets to create your own graphs!

Analyzing Your Results!

What trial did the best? Why?

What trial did the worst? Why?

Which design of the characteristic will you add to your prototype and why?

Draw a design of your new prototype below, gather materials, and build it for the next round of testing!

Round 4 of testing

Characteristic being tested: ____

Characteristic 4 Tested:	**Trial 1**	**Trial 2**	**Trial 3**	**Average**

Qualitative Data Collection Space (observations - data without numbers)

Graph **Title:** ______________________________________

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Note: You may also use the back of this paper and extra blank sheets to create your own graphs!

Analyzing Your Results!

What trial did the best? Why?

What trial did the worst? Why?

Which design of the characteristic will you add to your prototype and why?

Draw a design of your new prototype below, gather materials, and build it for the next round of testing!