**Paper Airplanes & Scientific Investigations**

Scientific Inquiry refers to the many ways in which scientists investigate the world. Scientific investigations are done to answer questions and solve problems. Many times, investigations are said to follow a Scientific Method. Scientific methods are steps that are followed during an investigation to make sure that the information gained during the investigation is accurate and true. This experiment will walk you through the steps.

**Part 1: Identify and State the Question or Problem**

You want to know which paper airplane design is best. The first thing you must do is decide what best means. For this investigation, we will define “best” as the plane that flies the farthest.

Now, decide what you would like to test: the length of the plane, the weight of the plane, the style of the plane, position of weights on the plane, or something else. Write a question that that states what you would like to investigate:

Example) Does wing size affect how far a paper airplane will fly?

*Your question:*

**Part 2: Background Research**

Find out what is already known about paper airplanes. There is research material available in the classroom on paper airplanes and flight. You may also use the Internet. Spend a little time reading up on paper airplanes. Write 3 – 5 notes here:

**Part 3: State a hypothesis**

Based on how we defined best and what you now know about paper airplanes, write a hypothesis that states which type of paper airplane (that you are testing) will fly the greatest distance and why you think this.

"If \_\_\_\_\_[I do this] \_\_\_\_\_, then \_\_\_\_\_[this]\_\_\_\_\_ will happen." If (cause), then (effect).

Example) If I use a plane with wings 2 inches wide, then it will fly farther than a plane with wings that are 3 inches wide.

*Your hypothesis here:*

**Part 4: Write a Procedure.**

When you design an experiment, you must first pick **one** thing to test, the length of the plane, the weight of the plane, the style of the plane, position of weights on the plane, and so on. This is called the **independent variable** – it is what you, the scientist will change or test.

**In my example above, my independent variable is the width of the wings. That is what I am changing.**

Everything else that could possibly change, but doesn’t, is called a **constant**. Scientists control all the variables they can so that they can be sure that the results of the investigation are due to the change in the one variable that is tested.

**In my example, the constants would be the type of paper, weight of plane, size of paper used to make a plane, location of flight test, wind speed, etc.**

You must decide what kind of data you will collect or what you will observe and measure. This is called the **dependent variable**.

**In my example, the dependent variable is the length of each flight (in meters).**

You need to repeat the experiment several times. These are called **trials**. Multiple trials help make sure that your data in consistent. If you only do an experiment one time, you might get some very unusual data for many reasons. Repeating the experiment allows you to be confident in your findings.

A list of **materials** is needed so that other scientists can repeat your experiment.

The procedure for this investigation is partially done for you. Add any extra steps needed for your investigation.

1. Select 3 different paper airplanes (in my example, I’d use three different planes with different wing widths).

a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Pick a spot to launch the planes each time.

3. Throw the first airplane.

Measure the distance the plane flew.

 Record the data.

 Repeat 4 more times.

4. Throw the second airplane.

Measure the distance the plane flew.

Record the data.

Repeat 4 more times.

5. Throw the third airplane.

Measure the distance the plane flew.

Record the data.

Repeat 4 more times.

List all of your materials below:

**Part 5: Collect & Record Data**

The dependent variable is the data you collect.

Data is frequently recorded in some type of chart or table. The chart has a place to show each specific independent variable, a place to record measurements (data), and a place to show averages or other statistics.

You will use the chart below to record your data; each part of the chart is labeled for you.



*To find the average, add up each trial for a plane and divide by 5.*

**Part 6: Analyze Data**

After your data is collected and recorded, you have to make sense of it. You look for patterns, trends, and relationships. You are really asking yourself, “What does this data mean?” Making a graph is a good way to help analyze data. A graph is a picture of the data and can help you visualize the patterns, trends, and relationships.

It is very important to use the right kind of graph when analyzing data. In this investigation, you compared different kinds of paper airplanes. Any time you are comparing data, a Bar Graph is the most appropriate type of graph to use.

All graphs have some things in common;

* 􀀯 The independent variable is on the X-axis (bottom).
* 􀀯 The dependent variable is on the Y-axis (side).
* 􀀯 Each axis is labeled to identify the variables.
* 􀀯 Units of measurement are included in the labels.
* 􀀯 The graph has a descriptive title.
* 􀀯 The information on the graph is spread out so that most of the graph is used.

You will use the graph below to record your data; each part of the graph is labeled for you.

