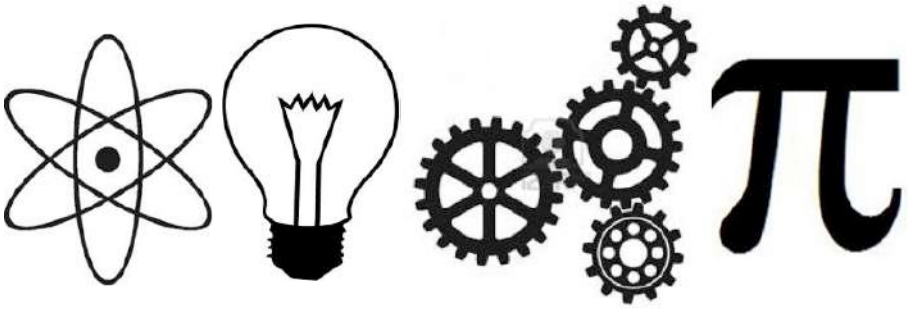
Pasco County Schools

Elementary STEM Fair



Science, **T**echnology, **E**ngineering, and **M**athematics

Providing an opportunity for students to utilize science knowledge and skills as scientists do in the real world.

Research Plan and Investigation Report Forms

Student Name: _____

Teacher: _____

Background Information

Providing students opportunities to make meaningful connections to the real world is critical as we develop the skills, behaviors, and dispositions necessary for college, career, and life readiness. Developing a S.T.E.M (Science, Technology, Engineering, and Mathematics) Fair investigation will provide students the opportunity to use science knowledge and skills just as scientists do in the real world. The STEM Fair will provide opportunities to engage in connecting these college, career, and life skills in many ways such as writing clearly, communicating information effectively, collecting and interpreting data, using evidence to justify their thinking, managing time, and providing opportunities to ask "why" leading to the development of an experiment or designing of a solution/innovation.

The information found in this *Elementary STEM Fair Research Plan and Investigation Report Form* document will provide guidance and support in developing the project. Throughout the document there are explanations and clarifications to help better guide student thinking. Students need to complete *Elementary STEM Fair Research Plan and Investigation Report Forms* and are encouraged to keep a journal with more detailed experiences and observations as they complete their investigation.

Table of Contents

Research Plan

The research plan needs to be completed before beginning the investigation.

Student Name: Johnny Appleseed

School: Trinity Elementary School

Address: 2209 Duck Slough Blvd. New Port Richey, FL 34655

Title of Project: Maximum Absorbency Challenge

Adult Sponsor: Meridith Appleseed

Where will you complete your experiment?

Home: X School: _____ Field: _____

Category (see page 4 for clarification):

Physical: X Earth/Space: _____ Life: _____

What is the question you are trying to answer or problem you are trying to solve?

I want to know which kind of paper towel is the best for absorbing liquid spills.

Describe the methods, materials, and procedures you intend to use.

I will test three types of paper towels by dipping each one an inch into a cup of colored water and measure how much water is absorbed with a ruler. I will need paper towels, cups, water, food coloring and rulers.

List any major sources of information that you are using for research. If you are studying animals, please make sure to reference animal care when appropriate.

I will be researching the construction of the three types of paper towels I will be testing.

Parent/Guardian approval:_____ **Date:** _____

Teacher approval: _____ **Date:** _____

Things to Consider When Choosing Your Investigation

What types of things do you enjoy in science? There are three different science categories your idea may fit into:

Physical Science: Do you find yourself wondering why or how things work? If so then you might want to choose Physical Science for your category. Topic examples may include things about matter, electricity, magnetism, sound, light, or energy.

Earth and Space Science: Do you find yourself curious about our Earth or outer space? If so then this may be the category for you. Topic examples may include things about weather, geology (things that make up the Earth such as rocks, fossils or volcanoes), or our Sun, stars and planets. Just a reminder, a model is not an experiment, so be careful when thinking about your investigation.

Life Science: Do you like plants, animals or are curious about why humans behave certain ways? If so then Life Science may be the category your investigation could fall under. (There are special rules anytime you work with animals. Please talk to your teacher to ensure you are following any rules).

Research to Help Support Your Investigation

After choosing your investigation category it is important to complete some research to better understand what your investigation is about. How do you complete research? You need to read! The information you gather while completing your research will assist in developing your hypothesis, designing your experiment or prototype (if applicable), collecting data, drawing conclusions, and communicate like a real scientist. Make sure to include at least the title, author, and date published or accessed.

Books or Articles about my topic:

What Makes a Paper Towel Strong? By: Kevin Reinhart (2003)

Internet Websites about my topic:

www.bountypapertowels.com accessed October 6, 2013

People I talked to about my topic:

My mom and dad

Statement of Question I am Answering or Problem I am Trying to Solve

Once a category has been chosen and research has been conducted begin to think about what type of question you are going to answer OR type of problem you are going to solve.

Example(s):

- *Question I am going to answer:* "Which brand of diaper is the most absorbent?" This is a good question which would allow students to go through the scientific process manipulating only one variable; the type of diaper.
- *Problem I am going to solve:* "I am constantly losing things out of my pant pockets. How can I create a pant pocket that keeps items inside?" This problem would allow the student to design a solution and test its effectiveness.

My question I am going to answer or problem I am going to solve:

Which type of paper towel is the most absorbent?

Hypothesis

The purpose of creating your hypothesis is to identify what you think will happen based on research that was collected. The hypothesis needs to be worded as an "If… then…because" statement explaining the cause and effect relationship that is being investigated. Evidence from your research needs to be used to support and justify your thinking.

Example(s):

- *Question I am going to answer:* **If** I put 30mL of water in the Huggies diaper **then** it will absorb the most water **because** Huggies diapers have an extra layer of polyfiber material.
- *Problem I am trying to solve:* **If** I create a magnetic pocket casing, **then** I will lose less items out of my pockets **because** magnets provide a tight seal due to their characteristics.

If I dip a strip of white kitchen paper towels an inch into a cup of water

then it will absorb the most liquid

because the white kitchen paper towels have a quilted design.

Testing My Hypothesis

Now that you used some research to develop your hypothesis it is time to begin your investigation to help answer your question or solve your problem. The next few pages will help giude you in setting up and conducting your investigation.

Materials: What types of materials will be used to conduct your investigation? Make a list of them here using either words or pictures.

1 ruler
1 bottle of blue food coloring
5 one inch strips of brown paper towels
5 one inch strips of white quilted kitchen paper towels
5 one in strips of white disposable paper dinner napkins
1 pair of scissors
1 pencil
1 cup
1 spoon

Variables: *A variable is a fancy word for things that you will be changing or keeping the same throughout your investigation. There are 3 types of variables:*

- *Independent: This is the variable that will be changed in your investigation.*
- *Dependent: This is the variable that will show an effect in your investigation.*
- *Constants: These are all the things that will be kept the same throighout you investigation to make sure it is valid.*

Example(s):

*Question I am going to answer: **If** I put 30mL of water in the Huggies diaper **then** it will absorb the most water **because** huggies diapers have an extra layer of polyfiber material.*

- *Independent variable: The different brands of diapers that are being tested (Huggies, Pampers, Luvs)*
- *Dependent variable: The amount of water absorbed (measured using mL) by each brand of diaper.*
- *Constants: temperature of the water, location in the diaper in which water is poured*

*Problem I am trying to solve: **If** I create a magnetic pocket casing, **then** I will lose fewer items out of my pockets **because** magnets provide a tight seal due to their characteristics.*

- *Independent variable: The different types of materials tested to create the pocket casing.*
- *Dependent variable: The number of shakes the pant pocket can withstand before losing its contents.*
- *Constants: same pair of pants and sized pocket, same items placed in the pocket casing*

The **Independent Variable** that I will change in my investigation will be:

The different types of paper towels being tested (white, brown and napkins)

The **Dependent Variable** that will show an effect on my investigation will be:

The amount of water absorbed

The **Constants** in my investigation are:

The depth of paper towel being dipped

Procedure (Designing of My Investigation): What steps will I use to carry out my investigation? It is very important that the steps in developing/designing your investigation are recorded precisely so another student can replicate the investigation.

1. Using pencil, ruler and scissors cut white kitchen paper towel into five strips measuring 1 inch by 8 inches.
2. Repeat step one using brown paper towels and white disposable dinner napkins
3. Using pencil measure 1 inch in height on each strip of paper towel and mark the spot by drawing a straight line with a pencil.
4. Fill cup with water and squeeze 5 drops of food coloring into the water then stir with spoon.
5. Take one strip of white kitchen paper towel and dip it into the cup to the 1 inch mark measured in step 3 and hold in water for 10 seconds.
6. Remove strip from cup. Using ruler measure the height the water rose on your strip and record results in data chart. Repeat this step 4 more times for the remainder of the white paper towels.
7. Repeat step 6 for the brown paper towel and white disposable dinner napkin strips.

If I am *answering a question* do I need to draw a picture of how I will set up my experiment? If I am *solving a problem,* a labeled diagram of the proposed solution needs to be sketched here.

sketch would go here

Data and Results

When conducting your investigation it is important to collect some data (information) to help either prove or disprove your hypothesis. When you are collecting data please make sure to be as precise as possible in using labels, dates, and even pictures. Once you finish collecting your data it is important to record your data/results into a table and then organize it into a chart or graph to easily communicate your findings. Please use additional pages or a journal to record your data and organize it into charts, tables, and graphs.

Data and Results collected over time:

White Kitchen Towel #1 #2 #3 #4 #5
Brown Paper Towel #1 #2 #3 #4 #5
Disposable Napkin #1 #2 #3 #4 #5

Organizing my Data and Results into Charts, Tables, and Graphs:

Towel Type	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
White Kitchen	2in.	2 1/2in.	2 1/2in.	2 1/2in.	2 1/2in.
Brown	1 1/4in.	1 1/2in.	1 1/2in.	1 1/4in.	1 1/2in.
Disposable Napkin	2 in.	1 1/2in.	1 1/2in.	2in.	2 in.

Conclusion

During your investigation you have learned many new things including whether or not you were able to prove or disprove your hypothesis. Your conclusion should be a summary of your results and state whether or not your investigation supported your hypothesis. Use the questions below to help guide you in sharing what you learned.

- Did you results support your hypothesis? Identify and explain the types of data you used to prove or disprove your hypothesis.
- What did you learn from the trials you conducted in your investigation?
- What types of problems did you encounter throughout your investigation?
- If you conducted this investigation again, what would you do differently?
- How does your investigation make connections to real life?

After completing my investigation and reviewing results from each of my five trials, I found
that my results supported my hypothesis. When I measured the height that the liquid rose on the
strips of paper towels, I saw that consistently the kitchen paper towels had the highest levels.
This told me that this type of towel would absorb the most liquid and hold it.
From completing this investigation I learned that it is not a good idea to test something only
once to determine an answer. When conducting my trials, the white paper towels absorbed the
most liquid each trial except for one. If I would have only done trial 1 I may not have came to the
same conclusion. I also learned that when I have a spill around the house, the white kitchen
paper towels would be the best choice for helping me clean it up.
A problem I encountered while doing my investigation was that I didn't put enough food
coloring into the water cup. When I was trying to determine how far the water level rose on
each of my strips of towel it was difficult to see where the water stopped.
If I conducted this investigation again, I would use more food coloring in my water cup to
give it a darker color and make it easier to see. I would also test 3 brands of the same paper
towel type. I think this investigation would help me see which brand would be the best to buy.
This investigation connects to real life because we use paper towels at my house for dinner
every night. Me or my little brother is constantly spilling something and my mom has to clean
it up. I think that knowing the right type of towel that would do the best job could save me and
my mom some time; it could also save my mom money because she wouldn't be wasting so
many disposable napkins trying to clean up the mess.

Abstract

The abstract is the part in your project log in which you summarize the entire investigation. Remember to include things such as your questions you were trying to answer or problem your were trying to solve, hypothesis, procedure, data/results, and conclusions based on evidence collected.

Student Name: Johnny Appleseed

Project Title: Maximum Absorbency Challenge

School: Trinity Elementary School

For my investigation I wanted to know which type of paper towel was the best to use for cleaning up a mess when I spilled something at home. I decided to test three types that we usually had around the house; white kitchen paper towels, brown paper towels and disposable kitchen napkins. I hypothesized that when I dipped each towel into a equal amount of liquid that the white paper towels would be the most absorbent because of their quilted design. I cut one inch strips of each type of paper towel that I was testing dipped each one into an equal amount of liquid for an equal amount of time to determine which towel would absorb the most liquid. When I pulled each strip out of the water I observed how far the water had risen up the strip of towel and used my results to determine which type of towel was most absorbent.

My results showed that white kitchen paper towels were the most absorbent. In my trials, this type of paper towel had the highest level of liquid nearly every time. I proved my hypothesis correct, and now I know that when I have a spill I will be reaching for the white kitchen paper towels to help me clean it up!

Acknowledgements

Who helped you with your project?

My mom and dad helped me complete my project. They helped me by buying my materials and helping me cut my strips of paper towel.

Backboard Suggestion

The following is a suggested layout for your backboard. You need to make sure that the abstract is in the lower left hand side of the board.

Problem/Need	**Title**	Data and Results
Hypothesis		Tables and Graphs
Materials/Equipment	Procedure	
Abstract	Labeled Diagrams or Pictures of Investigation or data as it's being collected	Conclusion