

**3<sup>rd</sup> - 5<sup>th</sup> Grade**

**STEM**

**Journal**

**Name** \_\_\_\_\_

**Date** \_\_\_\_\_

# STEM Reminders!

- Experiments with humans or animals are NOT allowed
- Experiments need to have 3 trials – so they must be repeated 3 times
- Backboards should be placed in the gym on STEM day – March 30<sup>th</sup> at 8:45 am

# The Question

## When forming a question...

\***the goal** is to ask a question which can be answered by observation in an experiment.

We need to **ask a testable question**.

\***think about** questions you have wondered about, but have never been able to answer or prove.

\***try some experiments** and think how you could choose one variable to test. During your experiment it is important to **test one variable at a time**

\*Remember you **CANNOT test animals or people!**

## Sample Questions....

- 1) Which paper towel is the strongest (or which type of paper is the most absorbent)?
- 2) Does an ice cube melt faster in air or water?
- 3) How long can suction cups stick to different surfaces?
- 4) Which cheese grows mold the fastest?
- 5) Which brand of diaper holds the most water?
- 6) Does a plant grow bigger if watered by milk or water?
- 7) Which grows mold faster -- moist bread or dry bread?
- 8) What type of soil filters water best?
- 9) How does friction affect the distance an object will travel?
- 10) How does temperature affect the water uptake of celery stalks?
- 11) Does applying more friction affect the ability (lasting power) of static electricity?
- 12) At what rate do various metals rust?
- 13) Does the temperature of water affect the speed at which something dissolves?
- 14) Does the weight of paper used to construct a paper airplane affect the distance it can travel?
- 15) Do different kinds of chocolate (white, milk, dark, etc) melt at the same rate?

Once you have an idea, use the questions below to see if it is a good fit for you!

Can you answer "YES" to all the following questions? If not, select another idea.

1. Am I interested in the topic?
2. Can I find research material on this topic?
3. Does the question require an experiment and testing to answer it?
4. Can I get all the necessary materials to do the experiment?
5. Can I do the experiment with only a little adult help, or all by myself?
6. Will I be able to do the experiment at least 3 times?
7. Will I be able to measure my test results in some numerical way through a graph or data table?
8. Do my parents approve of my project?

# Question

If you would like to create your own questions, use the format below!

Your question should fit into one of the following word formats. Choose one.

1. How does \_\_\_\_\_ affect \_\_\_\_\_? (Example: How does the type of insulation used affect the temperature of water in a container?)
2. What is the effect of \_\_\_\_\_ on \_\_\_\_\_? (Example: What is the effect of glycerin on a bubble solution recipe?)
3. Which \_\_\_\_\_ is \_\_\_\_\_? (Example: Which brand of paper towel is the most absorbent?)

# Variables

(this DOES NOT go on the display board)

- **Independent Variable** – the factor that will be changed on purpose during the experiment to find out what effect it has on something else.
  - ONLY ONE
- **Dependent Variable** – the factor that is observed and measured to see if it is affected by the change made in the independent variable.
  - ONLY ONE
- **Control Variables** – the factors in the experiment that must be kept exactly the same to make sure that they are not having any effect on the dependent variable.
  - WILL HAVE MORE THAN ONE

Identify the independent, dependent and control variables for your experiment. Write them on the lines below.

Independent Variable (the one that you changed on purpose)

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Dependent Variable (what you are going to record for your results)

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Control Variable (what you kept the same)

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# Hypothesis

Now, using your background knowledge, and any additional information you have gathered, write a hypothesis. The hypothesis states your educated guess about the solution to the question or problem. It is written as a short paragraph stating what you think will happen when you do the experiment and why you think this.

STATE THE HYPOTHESIS

I think... because...

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# Procedures and Materials

The procedure is the step-by-step directions to do your experiment. Materials are all the items you will need.

In order to test your hypothesis, you must design an experiment. Be very specific and give step-by-step directions, just like a cooking recipe or assembly instructions. Be sure to measure (use metric) accurately and record everything. **Remember to repeat the experiment at least 3 times.** Someone else should be able to follow your procedure and get the same results.

The materials for your experiment can often be found around your home, the grocery store, hardware store, or craft store. Control your spending, the cost of the project has no relationship to the quality of the project.

## Materials

List your materials below. What do you need to conduct this investigation?

*You MUST be specific with the sizes, colors, amounts, etc.*

**BE SPECIFIC...** Use the column titles to GUIDE you!

<b>Material</b>	<b>Color/Type (if needed)</b>	<b>How Much/ How Many?</b>	<b>Amount/Size</b>		

## Procedure

Procedure: note where you might like to take pictures with a star so you remember. They make a great addition to a display board. Use the lines below to write your procedure, be sure to write in complete sentences.

**\*DO NOT use I, as in "I will pour 3 cups of water into the pot"**

**\*All statements should be a direct command and begin with an action word – "Pour 3 cups of water into the pot"**

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

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4. \_\_\_\_\_

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5. \_\_\_\_\_

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6. \_\_\_\_\_

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7. \_\_\_\_\_

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8. \_\_\_\_\_

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\_\_\_\_\_



9. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(you may need more space, so continue on another sheet of paper)

## Conduct Experiment/ Record Data

First, collect all the materials needed for the investigation. Then, conduct the investigation and record the data in the form of a chart or table. Show the chart/table in the space below.

Look at the sample below for the format to set up your data chart!

Effect of Fertilizer on Plant Height  
Height (in centimeters)

Type of Fertilizer	Trial 1	Trial 2	Trial 3	Mean
None				
Miracle Grow				
Organic				
Store Brand				
Commercial				

\*Create your own data table, using the above as a model.

# Results

## Display Data

### ONLY GRAPH THE MEAN – NOT THE TRIALS

Mean – to calculate the mean, add up all numbers in a data set and divide by the number of items in the data set. (if you are doing 3 trials, you would add up all of the trials and divide by 3, to calculate the mean)

Make your chart or graph and record data on the sheet. Later, you may want to put your information into the computer, so it is ready for your display board, but you should hand write it here first. You don't want to do your experiment next to the computer do you?

The following website is a great resource to use if you want to make your graph on the computer.

<http://nces.ed.gov/nceskids/createAgraph/default.aspx>

**DO NOT CREATE A 3-D GRAPH!**

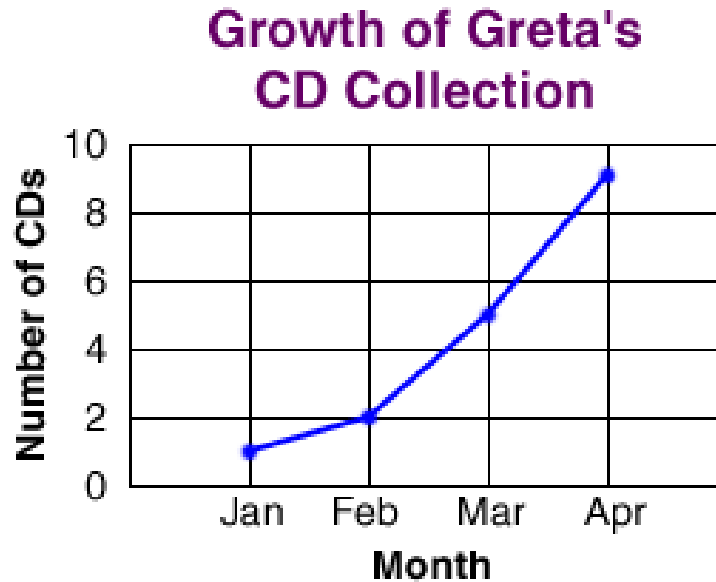
If you do not do your graph on the computer, you must use graph paper and it SHOULD be neat!

**\*Remember that you MUST have a  
DATA CHART  
AND  
a GRAPH on your board!**

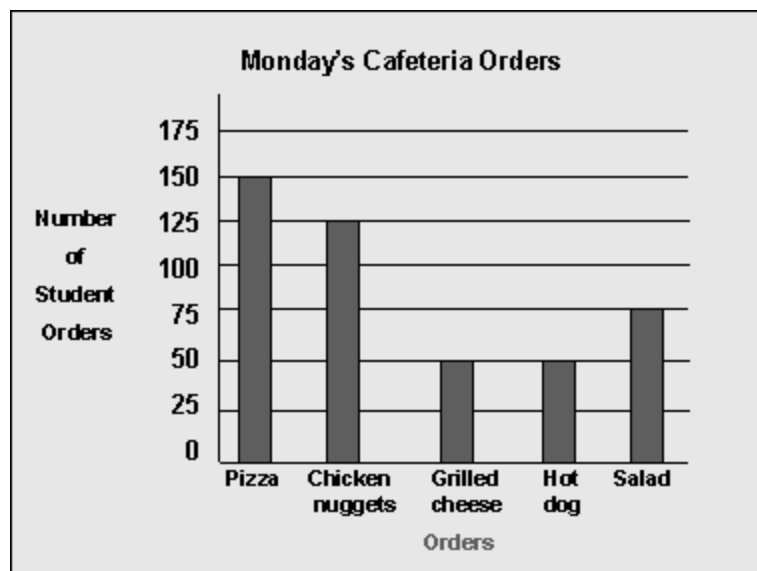
When creating a title for your graphs and data charts, your title MUST explain what the chart/graph is showing!

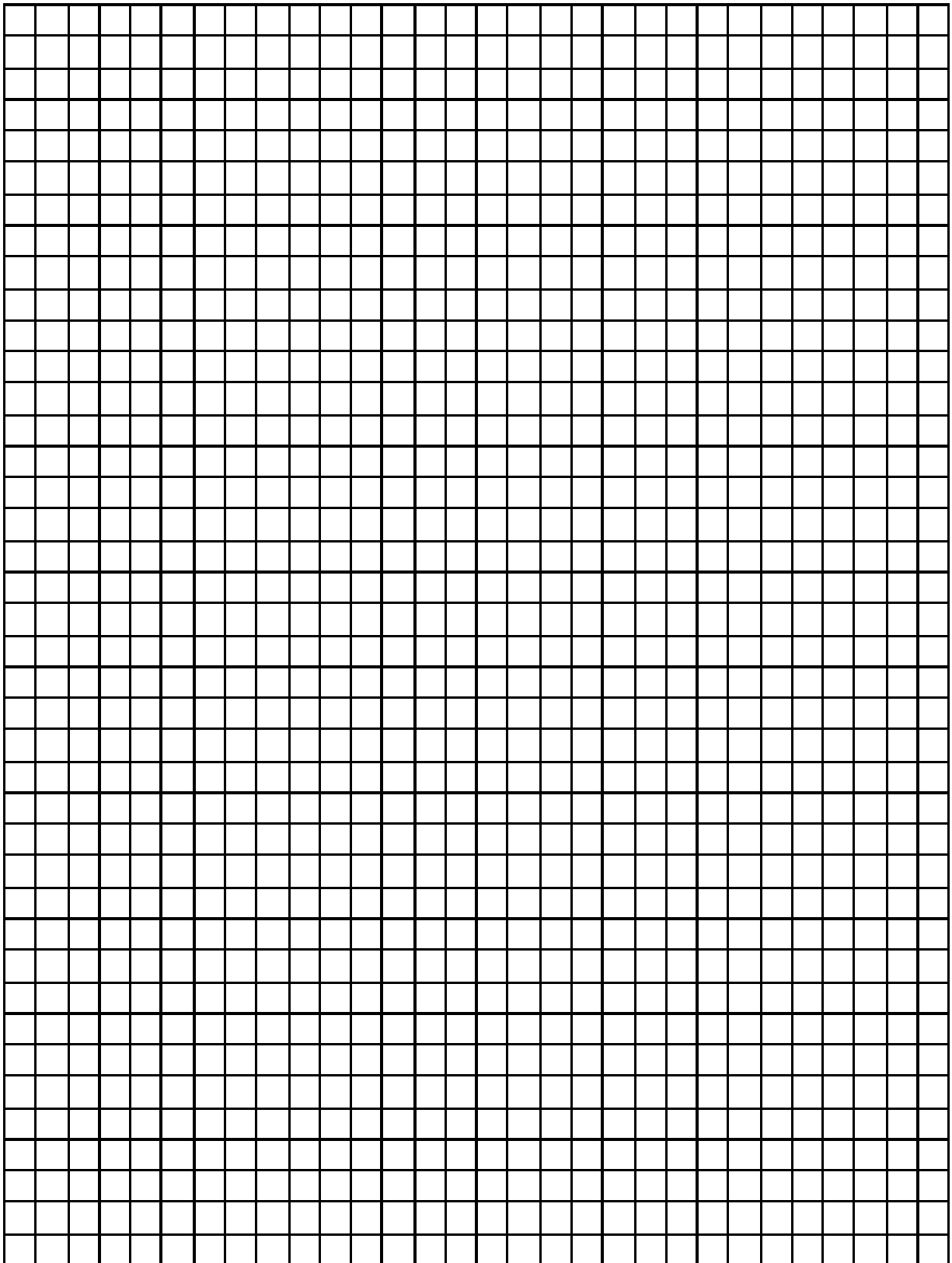
## Types of Graphs

- A **line graph** is graph using line segments to connect points. Line graphs usually show changes that happen over a period of time.
- For example:



- A **bar graph** is a kind of graph that we use to compare categories or groups of information. Bar graphs are usually formed with rectangular bars, arranged either horizontally or vertically, to show information.
- For example:





# Conclusion

Study your data and think about what happened. Is the conclusion the answer to your question or the solution to the problem? Is it based upon the results of the experiment? The data may be inconclusive. Did your hypothesis prove to be true? Your conclusion is a statement of the support or non-support of your results against your hypothesis. Fill in the conclusion outline that is listed below.

Your conclusion should be in PARAGRAPH form when placed on your backboard.

My hypothesis was/was not supported by the investigation. I thought that

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In this experiment, I found out that (answer the original question)

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The data showed that (include numbers and use COMPARISON words)

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One thing that I can infer from my experiment is (a reason why this happened)

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I would also like to find out (additional testable question to be investigated on same topic)

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## Choose a Title

Think of something original. List some words or phrases that are relevant to your topic, and that you might consider. Put a star next to the one you chose. Remember, it must be short, catchy, on the topic and **NOT** in the form of a question. **Make sure this title finds its way to your display board, and to the cover of your journal.**

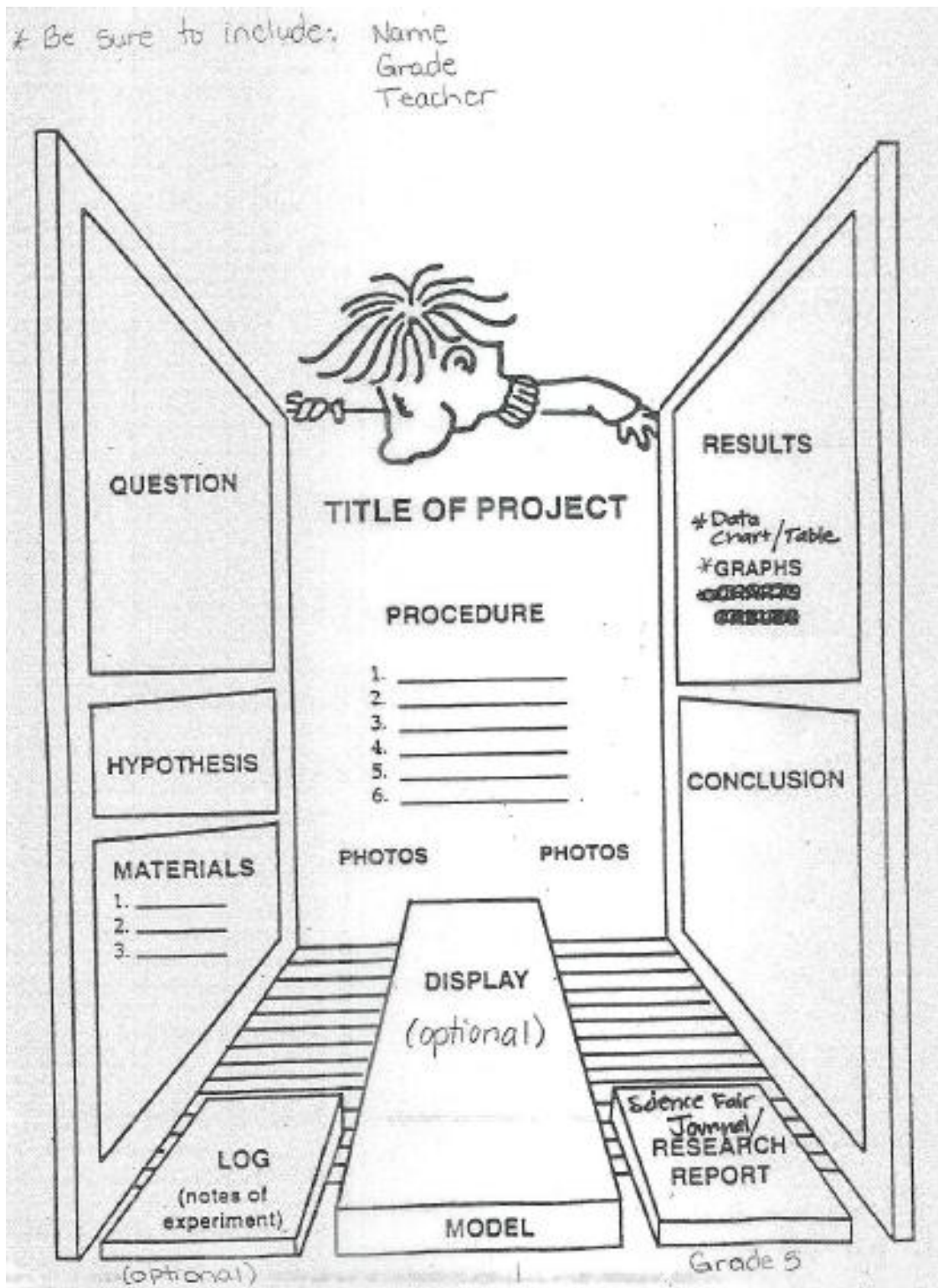
# Project Display

The project should be displayed in a neat, clearly visible, well organized and concise format. Use your creativity to design the display, with the following considerations: (see attached diagram)

- The title should be placed on the center panel and should be at or near the top of the board. *The question, hypothesis, procedure & materials, and the results & conclusions pages should all be typed and included on the display board.*
- Your name, grade, and teacher should be at the top under the title of the project.
- You may want to have a table display that goes along with your project. Small scales models or photographs can replace inappropriate or oversized equipment. (please do not bring glass items)
- All parts of your display should be neatly and clearly displayed. Your display should reflect the effort that you put into your project. IF the display board is white don't put white computer paper directly on it. The white paper should be backed then attached to your display board.
- All parts of project should be typed and backed with construction paper



Use the diagram below to model how your science fair board should be arranged.



## Presentation to Scientists

You will be presenting your project to the scientists on STEM DAY in school. You should be able to clearly state what you did and found out in your science experiment. Use the outline below to practice, so you are prepared to give a well thought out presentation.

Follow the steps for a good presentation:

1. Tell how you came up with the idea.
2. Explain the question.
3. Explain your experiment; include the procedure, materials and data collection.
4. Summarize your conclusions.
5. Describe what you learned about how this information could be applied to future learning.

If you do not like to talk in front of people, practice your presentation in front of a mirror. Practice until you're ready for friends or family to listen.

Your presentation will be better if you're prepared.

Above all, be interested in your project. Your enthusiasm will make others interested in your project too.