2nd Quarter Project- 5th and 6th science
Final Due Date Research paper: Tuesday, November 21st

Final Due Date Board Display: Tuesday, November 27th

Skinner North Science Fair

Dear Scientists,

This year you will be participating in a school science fair! During this project, you will design and conduct an experiment. In science, we learn by doing – so get ready to plan and conduct an investigation, analyze data, and present your findings!

It is important to use your time wisely. To help you, I've assigned a few dates as **"check-ins"** for you to turn in parts of your project and get feedback about your progress so far. **Experiments take time** to plan, test, and put it all together. Leave plenty of time to gather results, analyze data, write your paper, and create a display to share with the rest of the Skinner North community.

I will provide some class periods to work on various parts of your project. These will be announced in advance, so that you can come to class prepared to complete these parts with my assistance during the school day. The **table below shows important due dates**, so mark these in your planner and keep this sheet handy.

Assignment:	**Due Date:**
Planning Guide #1: Topic, Testable Focus Question, Research Plan	Friday, September 29th, 2017 *You need to have your question approved by teacher before you write your procedure and begin testing.
Planning Guide #2: Research, Sources, Hypothesis, Materials, Procedure, Data Collection Plan, Safety Contract	Friday, October 13th, 2017
Planning Guide #3: Results: Tables, Graphs, Conclusion, Reflection, Applications	Monday, November 13th, 2017
Research Paper: Title Page, Table of Contents, Acknowledgements, Question and Hypothesis, Review of Literature, Materials and Procedure, Results, Conclusion, Reference List	Tuesday, November 21st, 2017
Final Project: Abstract and Display Board	Tuesday- November 27th, 2017
Classroom Presentations	November 30th- December 3rd, 2017
School Science Fair	Week of December 11th, 2017

Step 1: Choose a topic that interests you

Before you get started on your question, think about what branch of science is most interesting to you. Your question is NOT limited to the examples on this page, this is just to get you thinking.

- Life Science: This branch of science is the study of living things. This can include plants, animals, microorganisms, humans, or behaviors of living things.
- Physical Science: Physical science generally has into four subcategories- astronomy, chemistry, Earth science, and physics.

  ~ Astronomy includes planets, stars, and eclipses.

  ~ Chemistry has to do with chemical reactions, matter, and properties of matter.

  ~ Earth Science includes weather and climate, rocks and minerals, and plate tectonics.

  ~ Physics deals with motion, energy, heat, light, electricity, magnetism, and engineering.

Step 2: Come up with a testable question

Think of your topic in the form of an experiment and not a model.

What's the difference?

Experiment: 	How do different colored lights affect plant grow? How does humidity affect mold growth? How do various amounts of salt in water affect freezing points?
Model: 	Types of dinosaurs Model of a volcano How a circuit works Facts about the solar system

Testable questions can be answered through hands-on investigations. They involve changing one thing to see what the effect is on another thing. Here are some examples of testable questions:

1. The Effect Question

What is the effect of _____ on _____?

sunlight	the growth of plants
eye color	pupil dilation
brands of soda	a piece of meat
temperature	the size of a balloon

2. The How Does Affect Question

How does the _____ affect _____?

color of light	the growth of plants
humidity	the growth of fungi
color of a material	its absorption of heat

3. The Which/What and Verb Question

Which/what _____ *(verb)* _____?

paper towel	is	most absorbent
foods	do	meal worms prefer
detergent	makes	the most bubbles

STEP 3: Research your topic and develop a hypothesis

a. **Research**: Becoming an expert on the background information for your topic is what scientists do to prepare for their experiment and help generate ideas.

How do you become an expert?

1. READ – Read about your topic. Use encyclopedias, magazine articles, books from the library, and articles from the Internet. Record each source that you use so you can cite these later.
2. DISCUSS – Talk about it with you parents and other adults in the field to gain any background knowledge on your topic.

Example: If you are testing how various amounts of water affect plant growth, you may want to learn about the things that plants need to grow, the parts of a plant, and germination.

You will include some of this background information on your display, so keep track of the sources you used and what you learned from them. Use the "Master reference List" (attached) so you can cite them correctly on your Reference List page in your final paper.

You need at least 5 sources and at least one source should be a print source (book, article, encyclopedia). Make sure Internet sources are reliable and credible. For example, Wikipedia cannot be used and neither can someone's personal webpage, but NASA's webpage could. (Tip: Look for websites that end in ".gov", ".edu", or ".org")

b. **Develop a Hypothesis**: A hypothesis is an educated prediction you make about your testable question. Ask yourself - *What do I think will happen? Why do I think that?* Your prediction should include the word "because". Once you write your hypothesis, you may not change it, even if during the experiment you think it is wrong. It is ok if your hypothesis doesn't match your actual results; scientists disprove hypotheses all the time.

Example Testable Question:	Which material is the best insulator for a house?
Example Hypothesis:	If I test different types of insulators, then _____ will be the best insulator because it's thicker, more dense, and has pockets of air that retain heat.

STEP 4: Design a Procedure :

a. **Gather Materials**: What will you need to perform your experiment? Ask you parent/guardian to help you gather necessary supplies. Make a list of your materials and include the quantity that you will use for each.

b. **Identify Your Variables:** The variables are any factors that can change in an experiment. Remember that in order to create a fair test you should only test one variable at a time. Keeping your variables organized is key to getting accurate and clear results.

- **Controlled Variables:** These do not change. For example, if you want to test the effect that water has on plant growth, then everything that could effect the plants besides water should stay the same. The ***controlled variables*** would be the type of soil, type of plant, location, amount of sunlight, etc.
- **Independent Variable:** This is what you would change in your experiment. It what you are testing and should match your focus question. In our example, the amount of water given to each plant would be the independent variable.
- **Dependent Variables:** Also known as the responding variable, this is what you are measuring or observing in your experiment. It is the result of your test. For the plant experiment, the dependent variable might be the plant height or the overall health of the plant.

  Ask yourself - What will I change (*independent variable*)? What conditions will stay the same (*controlled variable*)? What will I measure/what changes as a result of the independent variable (*dependent variable)?*

c. **Write a Procedure**: A procedure is a list of steps that you did to perform an experiment. Scientists write out procedures so that others can replicate the experiment in the future. Make sure your procedure is written clearly enough so that someone else could perform the experiment in the exact same way that you did. The procedure should be written in a step-by-step, numbered format.

STEP 5: Conduct Your Experiment:

a. **Perform the Experiment**: Have your materials ready and conduct your experiment! Be sure to follow the procedure you wrote step-by-step. It would be a great idea to take pictures along the way so that your audience can see evidence of your experiment taking place.

b. **Collect Your Data**: This means write down or record the results of the experiment. Be sure you organize it in a way that is easy to read and interpret the results. Most scientists use tables, graphs, and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results.

Decide how many trials will give you an accurate result or how often you need to record data along the way. You may need to find an average if you collect multiple trials. Even if your results do not match what you thought would happen, it is important to record exactly what happens! Do not change any data or retest unless you think a mistake was made during the experiment to make your test unfair.

There are two types of data that can be collected – quantitative and qualitative. You may use one or both types of data depending on the nature of your experiment.

1. Quantitative Data: uses numbers to describe the amount of something, involves tools such as rulers, timers, graduated cylinders, etc. **Use standard metric units** (meters and centimeters for length, grams for mass, and degrees Celsius for temperature).

2. Qualitative Data: uses words and/or sketches to explain what you observed and describes physical properties such as how something looks, feels, smells (if it is safe), tastes (if it is safe), and sounds.

Ways to Collect Data:

1. Keep a Science Journal: You can record observations, collect research, draw and diagram pictures, or take photographs. Do not use your science notebook from class.

2. Tables, Charts, and Diagrams: These tools will help you keep track of your data in an organized way. Make sure you include labels and a title.

3. Graphs: If you collected quantitative data, you need to display your findings in a graph. It is important to choose the most appropriate graph to communicate your results. Each graph listed below is for a specific purpose.

    a. Pie Graph: Shows percentages of a whole or group
    b. Bar Graph: Compares amounts
    c. Line Graph: Shows changes in an experiment over time

    All graphs need a title and labels. Some graphs require a key or extra information. Graphs should be made using Microsoft Excel or a similar program. We will have some time in the computer lab to work on graphs, but we do not have access to a color printer so make sure you bring your flash drive in case you would rather print at home.

STEP 6: Summarize Your Findings:

Use the following headings to structure each section. These will eventually be added to your display.

Part 1 – Conclusion: Use the following sentence starters to help you write this section:

- My science fair project is about …
- I wanted to find out …
- I hypothesized …
- I tested it by …
- I noticed or measured …
- My hypothesis was proven (correct/incorrect) …
- I know my hypothesis was (correct/incorrect) because my data shows…
- I learned (this is your conclusion) …

Part 2 - Reflection: Use the following questions to help guide your writing.

- Was your test fair? Do you think your results were accurate?
- Would you change anything about the experiment? Would you use different materials, a different procedure, or make improvements if you could repeat the experiment?
- Are you curious about something else now that you've completed your experiment? What would you want to do to further your experiment?

Part 3 - Application:

- Write about how this experiment can be used in a real life situation.
- How are the results of your experiment important in the field of science?
- How does your experiment connect to our lives?
- Does it explain how/why anything works the way it does?

Step 7: Write Your Research Paper *Due November 21st (You should be working on this throughout the entire project!)*

Gather everything you have written down**. Download the template on the Skinner North Middle School Website** to complete your research paper.

Research Paper Format Guidelines:

- Double Spaced
- 12pt sized font
- Times New Roman Font
- Include Page #'s
- Citations in APA format

Required Sections (put each section on its own page):

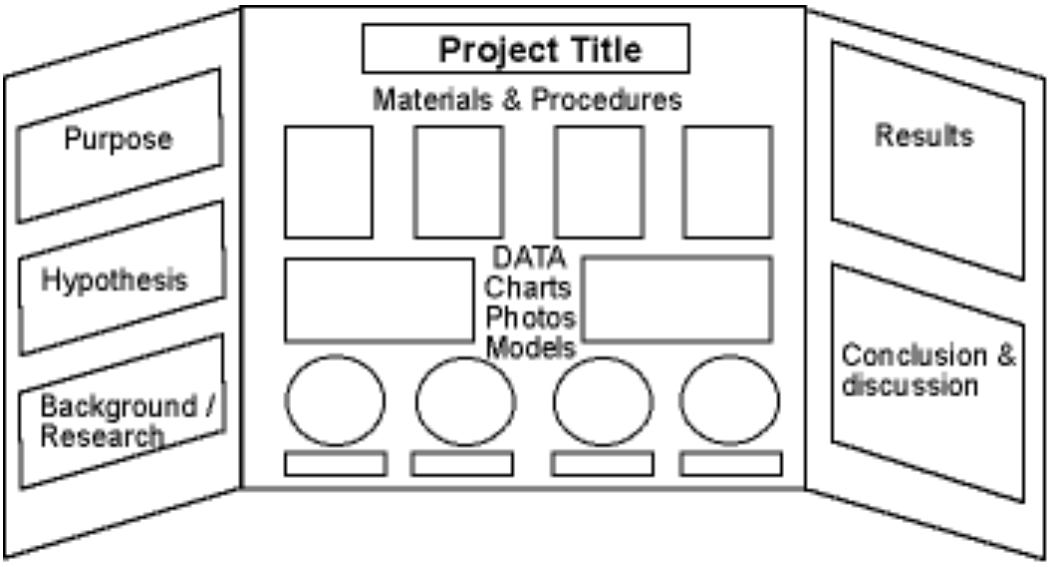
- Title page
- Table of Contents
- Acknowledgements
- Question and Hypothesis
- Review of Literature (Research with in-text citations)
- Materials and Procedure
- Results (tables, charts, and graphs)
- Conclusion, Reflection, Application
- Reference List (List of Sources- APA Format)

STEP 8: Prepare the Project Display and Abstract

Display: Gather everything you wrote down. Write or type your information so that it is clear and easy for others to see. You need a tri-fold display board. Neatly attach the titles, pages, and photos to the science fair project board. Prepare any samples to set on the table in front of your display.

Your display should include the following:

Example:



Make sure you include a **heading** for each section on your display board!