Name _____ Class _____
Partner(s) _____

6th Grade Science Fair Activity Guide

My goal is to collaborate with my group to design an experiment about environmental science using the scientific method.

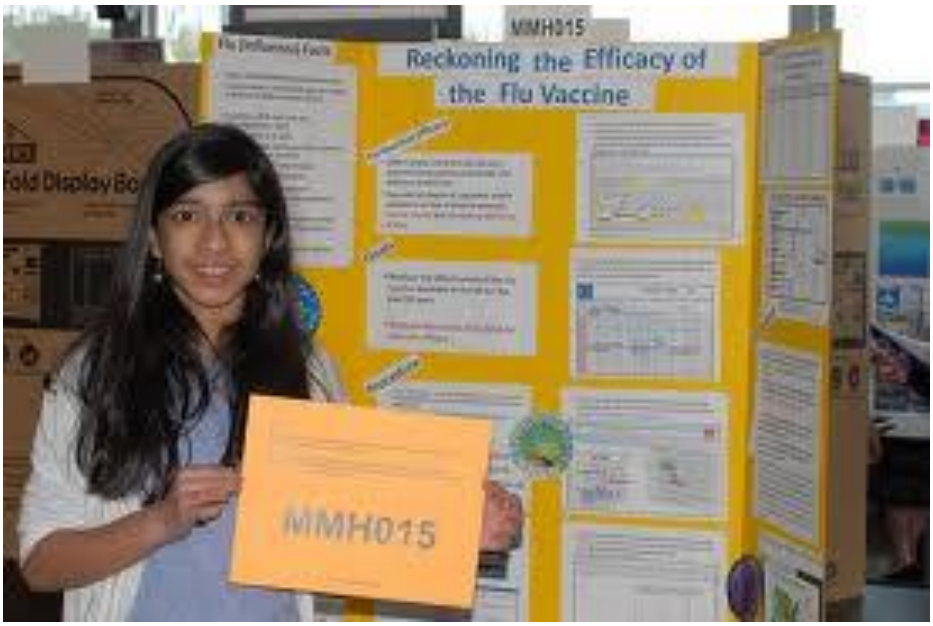
We Will: Design and test our own experiment.
So that we can: Use the scientific method and demonstrate our science skills.
We know we've mastered it when: we successfully present our science fair project.

What is the Science Fair?

A **science fair** is a showcase of projects that are designed using the scientific method. This year, students will work in pairs to create their own original experiments.

Learning Goals

1) I can collaborate with my group and actively participate to design an experiment using the scientific method.
2) I can write a testable question.
3) I can write a hypothesis, a procedure, and identify an independent variable and a dependent variable using scientific language.
4) I can design perform an experiment that will test my question. After the experiment is performed, I can analyze the data and make a conclusion about the validity of my hypothesis.
5) I can answer questions and demonstrate understanding about my science fair project.



Agenda

Follow the schedule below to stay on-track and finish your project on time!

Day(s)	Where?	Activities	Checklist Student	Checklist Teacher
1-2	Class	**Testable Question** ▪ Choose a partner(s) ▪ Choose a testable question for your experiment ▪ Get approval from your teacher		
3-4	Class	**Background Research** ▪ Research the topic, find at least 5 facts ▪ Record the sources of your facts ▪ Use extra paper if necessary for additional research		
5	Class	**Identify Variables and Construct Hypothesis** ▪ Identify the independent and dependent variables, constants, and control group ▪ Make a hypothesis based on your research (if…then…because)		
6-8	Class	**Identify Materials, Write Procedure, Setup Data Table** ▪ Use checklist to write detailed procedure ▪ Make a list of materials ▪ Draw a blank data table ▪ Decide who is responsible for what roles during experiment 		
	Home	**Perform Experiment** ▪ Perform your experiment according to your procedure ▪ Gather and record data ▪ Revise procedure if necessary		
9-11	Class	**Create a Line Graph and Analyze Data** ▪ Use your data to create a line graph ▪ Identify a trend based on your data ▪ Write an analysis paragraph		
12	Class	**Conclusion** ▪ Determine if hypothesis was supported or rejected using evidence from experiment ▪ Describe limitations and improvements ▪ Identify real world applications ▪ Write conclusion paragraph		
13-15	Class/ Home	**Create Tri-Board** ▪ Prepare your tri-board according to the template ▪ Review the content of your board and make sure there are no mistakes. ▪ Practice presentation ▪ Prepare answers to possible questions 		
16-18	Class	**Present** ▪ Class Science Fair ▪ Gallery Walk		
March 21, 2016	School Science Fair	**School Science Fair for Finalists!**		

Day 1-2: Testable Question (IN CLASS)

Our theme this year is environmental science.
What specific topic within the theme interests you? _____

Possible Questions: Write 2 possible Testable Questions below. Then Answer "Yes" or "No" in the column to the right for your questions.	If you answered "Yes" to any of the questions below, the topic is not testable. Cross it out and choose a different topic
	1) Can it be answered with a yes or no? YES NO 2) Can the question be answered with a definition? YES NO 3) Can the question be answered without conducting an experiment? YES NO 4) Does the possible answer to this question need resources I don't have access to? YES NO
	1) Can it be answered with a yes or no? YES NO 2) Can the question be answered with a definition? YES NO 3) Can the question be answered without conducting an experiment? YES NO 4) Does the possible answer to this question need resources I don't have access to? YES NO

***When you have chosen a topic, See your teacher for approval!**

Write the **TESTABLE QUESTION** that you want to answer by performing this experiment.
This question must be approved by your science teacher!

This question must be in **testable form:*
***EXAMPLE**: "What is the effect of independent variable on dependent variable?"*

What is the effect of _____
(independent variable)
on _____**?**
(dependent variable)

Day 3 & 4: Background Research (IN CLASS)

BACKGROUND INFORMATION: Research any information about your topic that will help you design your experiment. Write at least 5 facts about your topic. Be sure to write down all your sources!

Fact #1: _____

_____

_____

- **Source #1:** _____

Fact #2: _____

_____

_____

- **Source #2:** _____

Fact #3: _____

_____

_____

- **Source #3:** _____

Fact #4: _____

_____

_____

- **Source #4:** _____

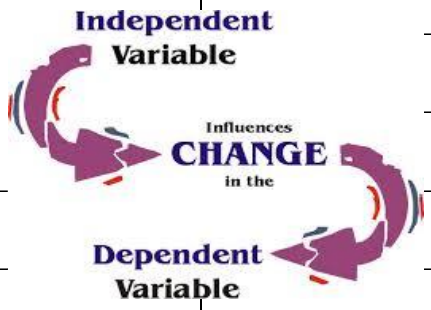
Fact #5: _____

_____

_____

- **Source #5:** _____

Day 5: Variables and Hypothesis (IN CLASS)

Independent Variable The Cause; purposely changed by scientist. *What will you (the investigator)* ***change****?*	**Dependent Variable** The Effect; measured in order to record the change observed. *What will you (the investigator)* ***measure****?*
_____ _____ _____ _____ _____	 _____ _____ _____ _____ _____

Other Variables	**What Is It?**	**What Is It In YOUR Experiment?**
Constants *(at least 3)*	The variables in your experiment that **DO NOT CHANGE** (no matter how you change the independent variable) ***Be SPECIFIC!***	1) _____ 2) _____ 3) _____ 4) _____
Control *(only if necessary, not all experiments need a control group)*	The group that **does not** receive the independent variable. Used for comparison.	

Hypothesis "If… then… because…" ***If*** *we change the IV like this,* ***then*** *we will see this effect on the DV*
If _____ then (change in independent variable) _____ because (this will happen with the dependent variable) _____ (reasoning)

Day 6 - 8: Identify Materials, Write Procedure, and Setup Data Table (IN CLASS)

Procedure
Write out each step of your experiment. **You may need more or less steps than what is below. Use extra paper if needed and USE A PENCIL!!!!**

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

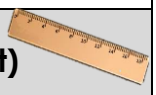
7. _____

8. _____

Procedure Checklist

	Verbs: Does every step begin with a verb?
	Amounts: Are all amounts clear, and do they all have units?
	Trial: Do you have 3 or more trials?
	Independent Variable: Does the procedure clearly tell you which variable is being intentionally changed
	Dependent Variable: Does the procedure tell you how to measure and record the data for the dependent variable?
	Constants: Does the procedure tell you what variables need to be controlled in order to have a fair, valid test?
	Reliable: Does the procedure tell you how many times you have to repeat the experiment in order to get accurate data?

Use this box to provide an illustration (picture) of your procedure (if necessary).

 **Materials**	**Quantity (Amount)** 

Data Table

A **DATA TABLE** is a chart (boxes) where your numbers or observations are written.

Example of a DATA TABLE:

Pulse Rate Before and After Exercise

Student Tested	Pulse Rate at Rest (beats/min)	Pulse Rate After Exercise (beats/min)
A	70	97
B	74	106
C	83	120
D	60	91
E	78	122

In the box below, create a blank data table for your experiment.

Here, write down any observations (things you see, hear or smell) that you make while doing your experiment.

Performing the Experiment (at home)

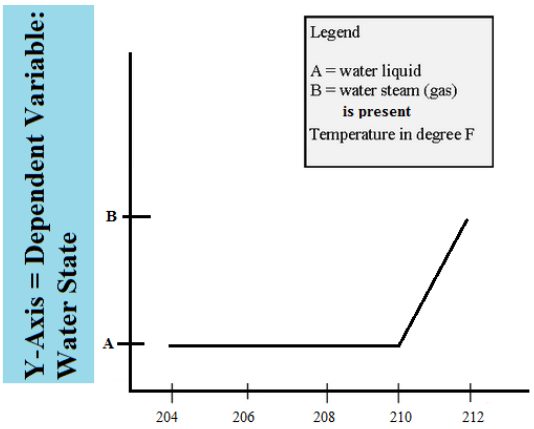
Now you're ready to do your experiment! Your experiment and data collection will take place outside of school on your own. *Record your data in the data table you made above.* Be sure to take pictures and note any changes to your procedure or materials. You should also begin gathering materials for your project board and typing up your board sections (based on this packet). Your data will be due _____, when we begin working in class again.

Day 9 - 11: Line Graph and Analysis (IN CLASS)

Now, use the data table to create a **graph**:

Example of a LINE GRAPH:

Title: Effect of Temperature on Water State



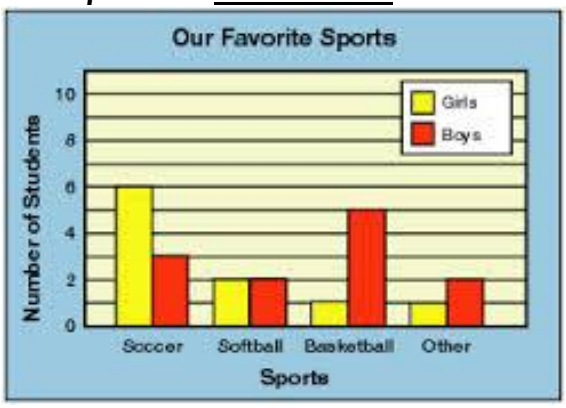
X-Axis = Independent Variable: Temperature

Graph Checklist:

Make sure your graph has:

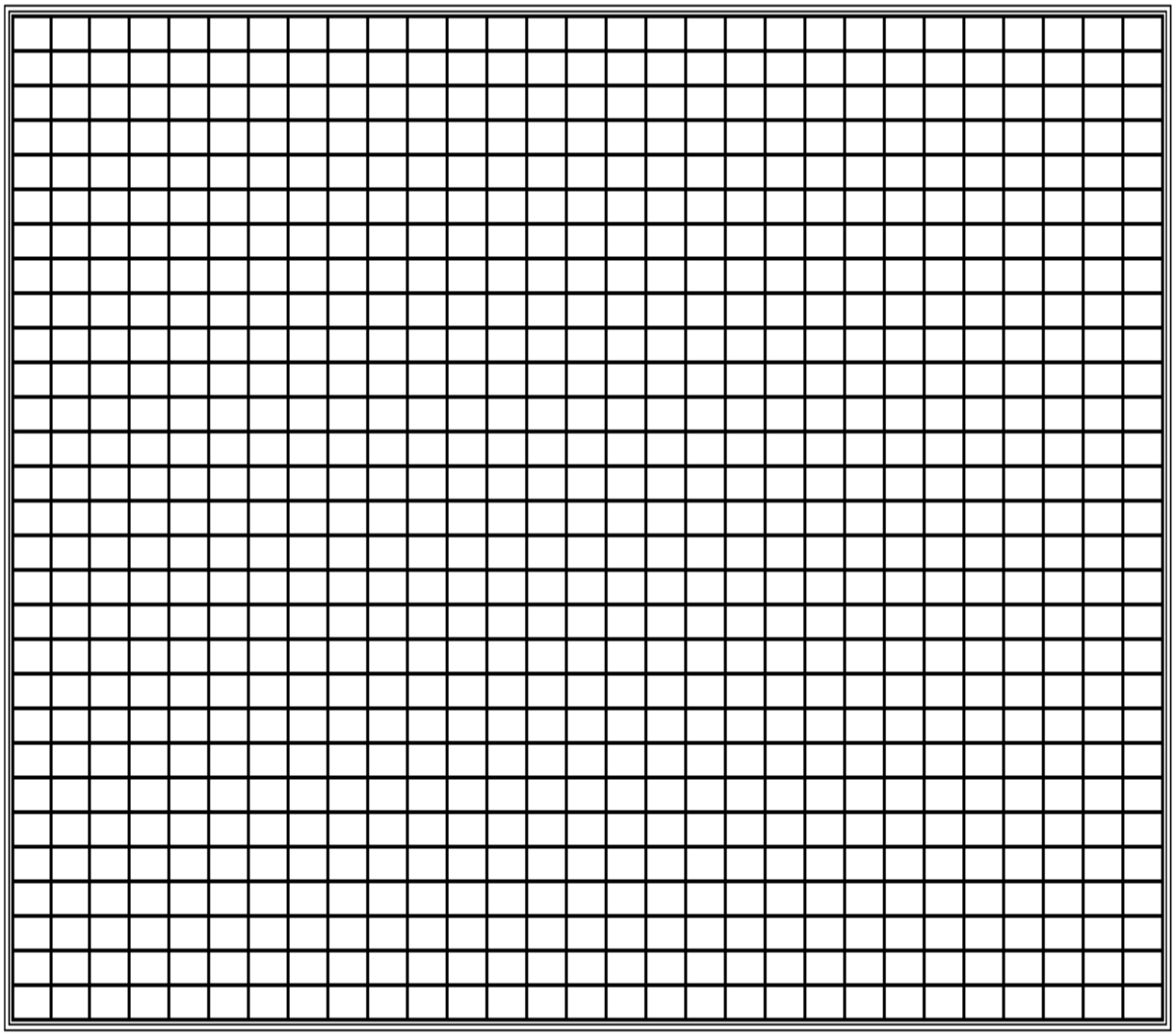
- ☐ **X-Axis Label (Independent Variable)**
- ☐ **Y-Axis Label (Dependent Variable)**
- ☐ **Scaled Axes**
- ☐ **Title**
- ☐ **Legend/ Key**

Example of a BAR GRAPH:



Type of Graph	When to Use It
Bar	**Comparison**
Line	**Change Over Time**

Using the data you recorded while performing your experiment, make a line graph in the box below.



Graph Checklist:

- ☐ **X-Axis Label (Independent Variable)**
- ☐ **Y-Axis Label (Dependent Variable)**
- ☐ **Scaled Axes**
- ☐ **Title**
- ☐ **Legend/ Key**

KEY:

1) What is the TREND shown by your graph?
(example: as the IV increases, the DV increases also)

2) What is your EVIDENCE for the TREND based on your *data table* and *graph*?

Write your ANALYSIS PARAGRAPH below. Your analysis should be a combination of boxes 1 & 2 above.

Day 12: Conclusion (IN CLASS)

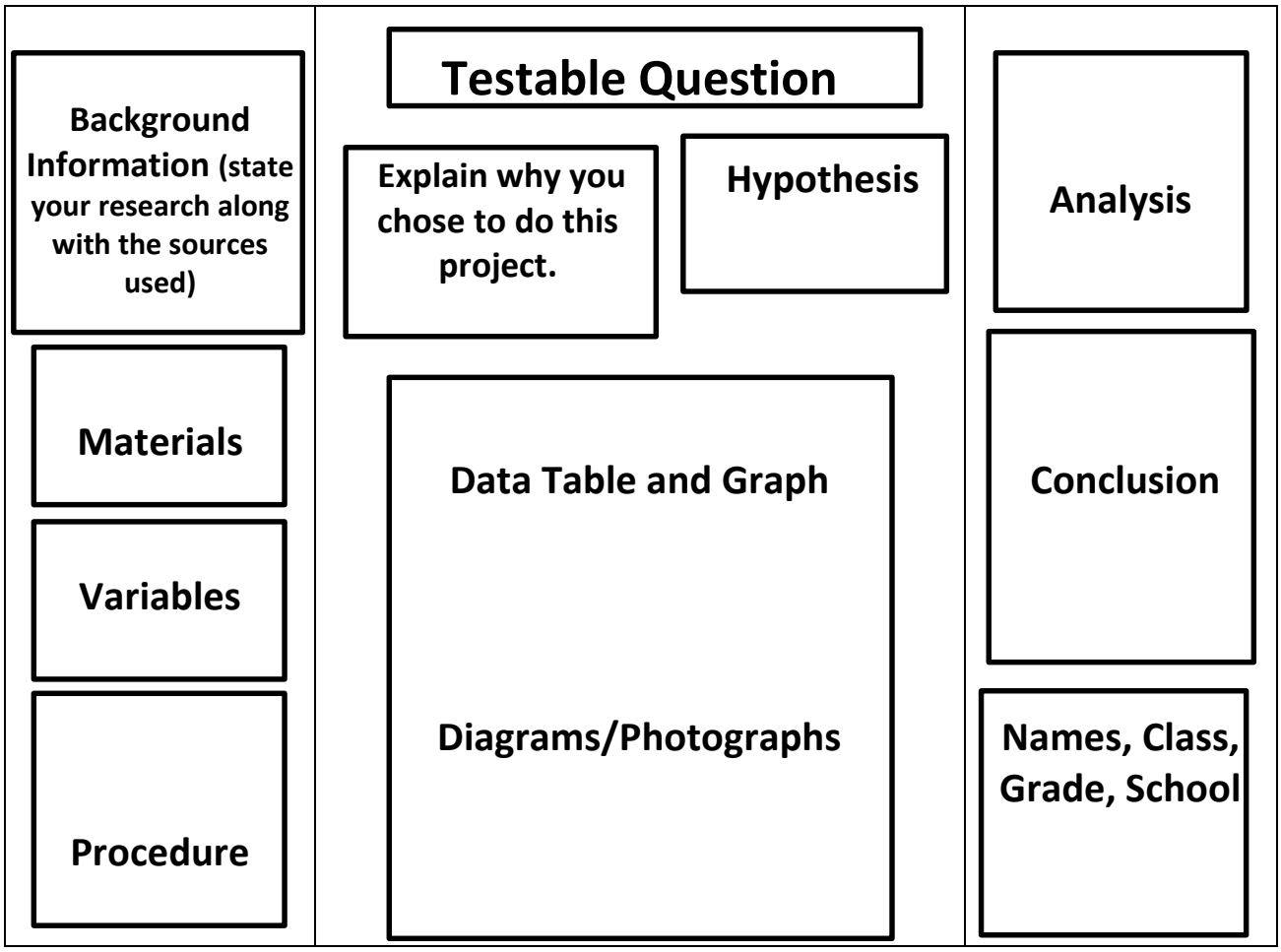
Box 1: Claim (based on evidence) ***What is the answer to your question based on the evidence?*** Is your hypothesis rejected or supported?	**Based on my data, hypothesis was (supported, rejected).** _____ (Independent Variable) **(does/does not) affect** _____ (Dependent Variable)
Box 2: Evidence (observations/data / trend/evidence) ***What is the data that supports your particular claim?*** Be **SPECIFIC**!	**My data shows that** _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Box 3: Scientific Reasoning (Why do you think this happened based on your research?) ***What scientific principles support your claim?*** Use quotes from **research**.	**I chose my hypothesis based upon research that stated** _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

Box 4: Limitations & Improvements (What are the limitations of your experiment? What could you do to improve this experiment next time?) ***"How could you improve your experiment?"*** (**<u>Limitation</u>**: anything that may have prevented your experiment from being reliable and valid; a source of error.)	**The limitations of my experiment were** _____ **I could improve this experiment by** _____
Box 5: Real-World Applications (Can it change people's lives? Can it make things easier? Can it make something more affordable?) ***How does this project connect to the real world?***	**This project relates to the real world because** _____

Write your final CONCLUSION PARAGRAPH based on boxes 1-5 above.
Include your claim, evidence, scientific reasoning, limitations, improvements, and real-world applications in your paragraph.

Day 13-15: Create Tri-Board (IN CLASS)

Use the template below as a guide for how to set up your tri-board. All sections must be typed! Be sure to include **ALL** of the following information on your tri-board and get your teacher's approval before gluing anything in place!



Final Checklist: Did you remember to…?

- ✓ **Make a heading for each required part of the board** (Conclusion, Procedure, Hypothesis, etc.)?
- ✓ **Make sure your board is organized and neat**? Are the lines straight? Is the font size large enough to read from afar?
- ✓ **Create a title for and label** each graph?
- ✓ **Briefly describe** each chart and picture used on your board?
- ✓ **Proofread** your words for spelling and grammatical errors? Did you do this once and then ask someone else to do it again?
- ✓ **Write** your names and class on the Names section on the poster board?

Prepare to Present: Make sure each partner knows what to say and what questions to answer during a brief presentation.