STEP BY STEP SCIENCE PROJECT INSTRUCTIONS

HHES Science Fair 12/05/2018

A science project is an investigation using the scientific method to discover the answer to a scientific problem. Before starting your project, you need to understand the **scientific method**. The scientific method is the "tool" that scientists use to find the answers to questions. It is the process of thinking through the possible solutions to a problem and testing each possibility to find the best solution. The scientific method involves the following steps: doing research, identifying the problem, stating a hypothesis, conducting project experimentation, and reaching a conclusion.

1. **PURPOSE:** Tell the reasons you are conducting this experiment. What do you want to learn?

2. **QUESTION:** What is your scientific question? i.e. Do you really have more germs on your hands before you wash them? Are cats smarter than dogs? Do most toys live up to the advertising on TV?

2. **HYPOTHESIS:** Now that you have learned more about your topic, what do you THINK the answer to your question might be? This is your hypothesis. It's an informed guess or inference. A hypothesis is not a question. It is a statement of what you think is true, based on your research. The hypothesis should be written as an "IF…THEN" statement. For example: Question: Which seeds germinate quicker, carrot seeds or tomato seeds? Hypothesis: **If** I plant carrot seeds and tomato seeds, **then** carrot seeds will germinate quicker. Question: Which type of dog food does Pebbles like best: dry food or moist food? Hypothesis: **If** I give Pebbles a choice of dry food or moist food, **then** he will eat the moist food first. **Your hypothesis might be true or it might be false, therefore you need to test it.**

3. **MATERIALS:** List all materials you will use in the experiment. Indicate what was used and how much was used (you should bullet your list). What would another person need to conduct your experiment if they wanted to do it on their own?

4. **PROCEDURE:** List step by step directions used in conducting the experiment (number each step). Think about the factors that could change the results of your experiment… light, heat, cold and humidity, for example. You want to control as many variables as you can. Remember- variables are the factors or conditions that change and your controls are the factors and conditions that stay the same.

- Independent Variable: What I changed.
- Dependent Variable: What I observed.
- Controlled Variable: What I kept the same.

When you do your experiment, you might want to take pictures along the way. You want to document each step so that other scientists are able to do your experiment and get the same results. Be sure to write everything down through proper documentation in a log or journal. Always be as specific and clear as possible.

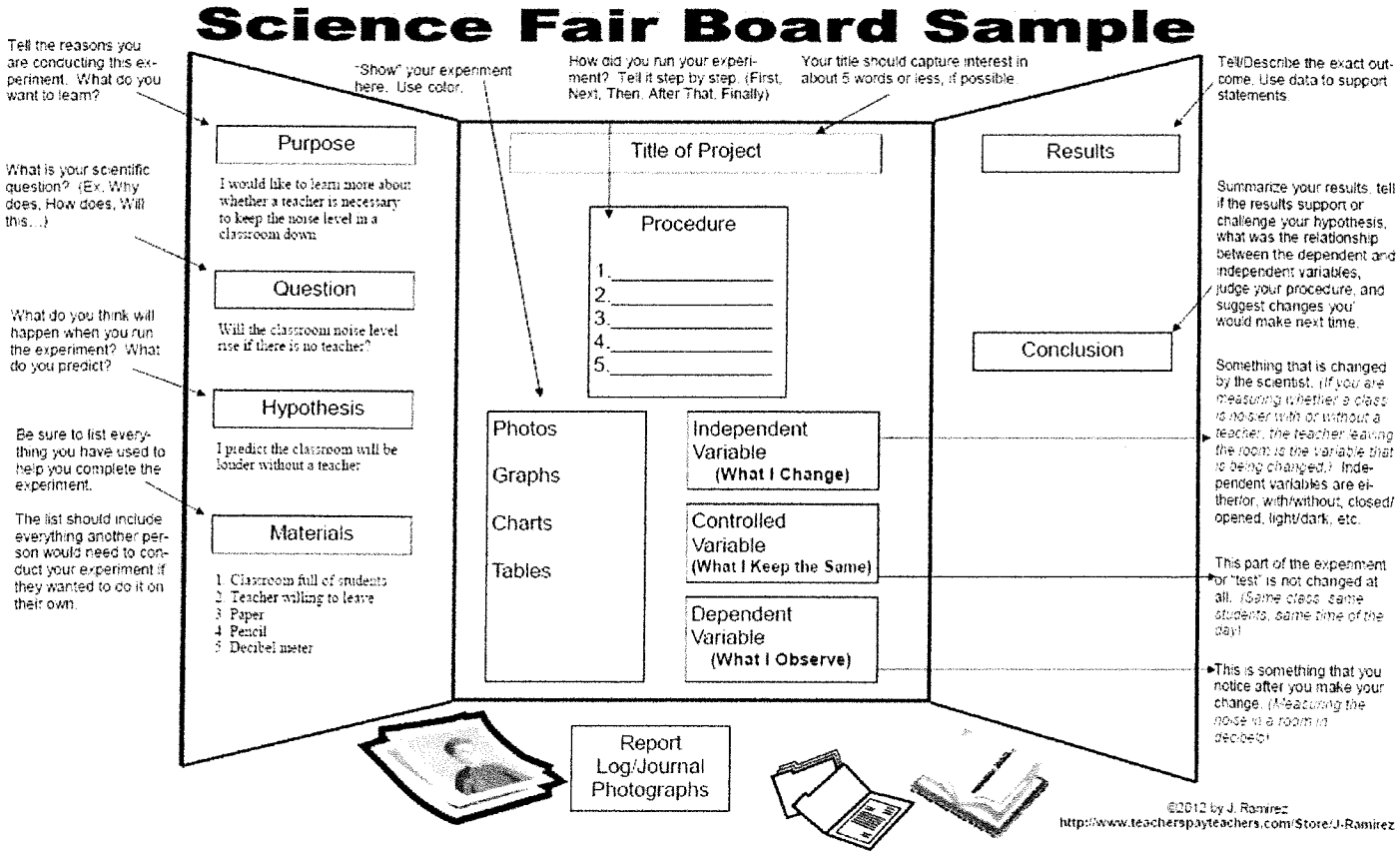
5. **OBSERVATIONS and DATA:** Collect and record information as you conduct your experiment. You should keep this information in a data folder or small notebook. Use charts, graphs, photographs, logs, or records to display what was observed and the data collected during the experiment. A good scientist always **double-checks** results. This is especially important if your hypothesis is different from what most people think. It is also important if your research disproves your hypothesis. You need time to conduct the experiment a **second and even a third time.** Follow the directions in your procedure. Does it turn out the same way each time? If not, what happened? Did you forget to follow one of the steps? Were there other variables that might have changed the results? Once you are sure your results can be **repeated by other people,** you need to draw a conclusion.

6. **RESULTS:** Tell/describe the exact outcome. Use data to support statements.

7. **CONCLUSION:** Write a statement summarizing the results of your experiment. Your graph and charts should show your conclusion. You conclusion must include **a statement of support or non-support for the hypothesis.** Suggest changes you would make next time.

PROJECT BOARD DISPLAY

- Choose a catchy, attention-grabbing title that accurately summarizes your research. It can be the Question in a "catchy" form (i.e. your question might be, "Which Bath Soap Cleans the Best?", but your title might be "Splish Splash I Was Taking a Bath").
- Everything on your board should be typed.
- Steps of the Scientific Method should be clearly stated on your board.
- Use a font size of at least 16 points for your main body text. Anything smaller is too hard to read.
- Use *italics* or **bold** for emphasis, not for all your text.
- Don't place text on top of a picture; that makes it difficult to read.
- Don't use ALL CAPS; THEY ARE MUCH HARDER TO READ.
- Don't use reverse type (white text on a dark background) it is hard to read. Use black characters on a white (or pastel) background.
- Don't use cursive fonts. They are much harder to read.
- Your project should be neat and visually appealing.
- See the Science Fair Board Sample below for a visual example.



Science Fair Report

Name:

Title: [Give the report a recognizable name.]

Research Question: [What did you type in to look for information?]

Background Research: [100 or more words, use a minimum of 3 sources – printed (books, articles, newspapers), or electronic.]

1. Introduce the topic, Quotes from books or other experts are appropriate as long as you document the source. To do a good introduction, assume that your audience knows a little science but is not familiar with your topic or subject at all.
   - The following are example questions to answer for a topic/subject of Acids----What is an acid?
     -How are acids made?
     -When were they discovered?
     -What do acids do?
     -What are acids used for?
     -How do you identify an acid?
     -What happens when you put acid on something? (Explain everything you can find so others understand what you are doing)

2. Now discuss specifically the part of the topic you are experimenting. Include how the variables might affect the experiment.

Problem/Purpose: [State the goal of your experiment. What are you trying to find out?]

Hypothesis: [Your educated guess or prediction, based upon previous knowledge, about what you think will happen or what you think the results of the experiment will be.]

Materials: [List the equipment, chemicals, etc. that you need to do the experiment. Specify sizes and amounts of all equipment and materials.] For example:

2 beakers
1.0 ml of HCL
0.2 ml of water
1 metric ruler, Etc.

Procedures: [List and number the steps to conduct the experiment. Be specific. Someone else should be able to repeat the experiment from your directions.]

1. }
2. } Write the steps of what you did.}
3. }
Etc. }

Observations: [Record your data, as appropriate, in the form of tables, graphs, descriptive information, etc. Make sure tables and graphs have a specific title that reflects the information provided.]

Analysis: [Summarize and discuss your results (what you actually found out from your data, tables, and graphs). Interpret and evaluate your data. Include, as appropriate, comparisons, rates of change, and explanation of what the data, tables and graphs mean.]

Conclusion: [State the objective! Your conclusion should answer the research question/hypothesis. It must be based on your observations and data (not on what you think should have happened), and must address whether your hypothesis was supported by the data or not.]

Reflection: [In every experiment you should answer these same questions.]

- What did you learn?
- What problems did you encounter?
- How would you design your experiment differently if you were to do the experiment again (e.g. change your materials, change your procedures)
- Do you have any new testable questions as a result of doing the experiment?

Bibliography: [3 sources minimum for background]

Place on separate page from rest of report.
Subject Label, date viewed, web address

You should site anything in your paper that is not your own original thought. You do not need to cite general information you find on a topic but any specific facts or ideas that you use should be cited. If you use a phrase directly from a source because they word it perfectly that is fine just give credit to the source by citing the source OTHERWISE IT IS ***PLAGERISM*** *(STEALING SOMEONE ELSE'S IDEAS)!!!! PLAGERISM IS EASY TO SPOT WHEN DIRECT QUOTES ARE TAKEN FROM ANOTHER SOURCE!!!!*

DATA LOG BOOK

This is your journal or diary for your project.
Start this on the first day of your project. Write qualitative descriptions of your experiment as well.

Data Collection:

1. Log must be dated (date and time)
   i.e. - September 1, 2018, I looked online with my parents/teacher and decided on a topic for my science project.
   - September 3, 2018, I researched the materials needed for my project.
2. You must write in **pen.**

Abstract

Length 250 words maximum

After finishing research and experimentation, you need to write a one page (250 word max) abstract. This is always done last! But it will probably be the first thing anyone will read about your experiment. The abstract is like the book jacket summary for a novel. The reader reads this to see if they want to read the whole report. An abstract should include the following;

1. What was the purpose of the experiment? (what did you hope to learn, what problem was the experiment trying to answer)
   -once again this might not be some super important goal but you were still trying to learn something.
2. Describe briefly the general procedure used. (Hit the highlights i.e. the variables)
3. Describe the data that was collected. (briefly summarize the data and note any patterns or anything unusual that was observed)
4. What conclusions were reached at the end of your experiment?
   -hypothesis (supported or not supported)
5. You could also include discussion about how this research is useful to the world.

REMINDERS:

- ✓ **Don't copy**. It's okay to get ideas for your project from someone else, but don't copy another student's work. Start from the beginning and do everything yourself. Copying someone else's work is called **plagiarism**. It is wrong.
- ✓ Begin early – don't wait until the last minute to begin working on your project.
- ✓ Credit your sources. While you do your project, you will probably get some help from people, books or websites. Be sure to list the help you got as part of your written report.
- ✓ Make sure that you have checked for any spelling, grammar, and capitalization errors.
- ✓ Before attaching anything to your board, place it flat on the floor and lay out all the lettering and have written material, graphs, pictures, etc. DO NOT attach anything until you are sure that you have room for everything and that all of your material looks neat and centered. Don't wait to do this until the day before it is due.

•If you choose a project involving human participants or animals, please keep in mind that these projects require additional paperwork.

The following are **NOT allowed** on your display board: *organisms, living or dead, including plants, animals, fungi, molds, bacteria, and all other microbes *photographs of animals in other than natural conditions *human or animal food *soil or waste samples * gases under pressure or super cooled gases, including dry ice *liquids, unless they are a critical part of an operative apparatus * highly flammable display materials, flames, or temperatures in excess of 75 degrees C * small objects that are not encased or attached to the project *sharp or sharp edged items (i.e. staples, tacks, syringes, needles, pipettes, corners, edges) *glass (NO unsecured glass of any kind- lenses, glass containers, frames, etc.) *unshielded lights, belts, pulleys, chains, or moving parts that pose a hazard (unless for display only- CANNOT BE OPERATED) *batteries (dry, wet, or gel cell) with open top cells, car or motorcycle batteries *uninsulated wiring or connectors, bare wire, exposed knife switches (except in DC circuits of 12 volts or less) *lasers (or other scientific instrumentation) that do not meet ISEF standards *equipment producing disturbing or distractive bright lights and/or loud sounds.