

NAME:

GRADE:

SALLYE MOORE

COLLEGE AND CAREER PREPARATORY ACADEMY

YOUR JOURNEY OF DISCOVERY STARTS HERE!



SCIENCE FAIR HANDBOOK

2018 - 2019

SCIENCE FAIR HANDBOOK

Your child has been invited to participate in the Sallye Moore Science Fair, an exciting event that encourages students to think and act like young scientists. During the next few weeks, your child will be designing a science project that uses the scientific method to solve a problem. We hope you agree that the educational benefits are numerous, as students develop skills in writing, oral presentation, creative thinking, and problem solving.

Each student will be given instructions and a workbook for the various steps of his or her project. Most of the work will be completed at home, and students will receive due dates for each part of the project. For suggestions on helping your child through this process-from choosing a topic to the final report-see various web sites, such as:

www.sciencebuddies.org

www.all-science-fair-projects.com

www.cool-science-projects.com/Science-Fair-Project-Ideas.html

<http://school.discovery.com/sciencefaircentral/>

We ask that you encourage your child and monitor his or her progress along the way. Your support is the key to a successful project, but please do not allow your involvement to extend any further in order to assure equity and promote student learning. Guide your child whenever and wherever you can, but let the final project reflect your child's individual effort and design.

Please read the Science Fair Handbook with your child and sign the necessary forms. Let us know if you'd like more information on creating a successful science fair project. If you have any questions, do not hesitate to contact their teacher.

Sincerely,

Science Fair Coordinator

School: _____

Contact Information: _____

Important Science Fair Due Dates

Workbook Section 1 – Wednesday, January 16, 2019

Workbook Section 2 – Wednesday, January 30, 2019

Workbook Section 3 – Wednesday, January 30, 2019

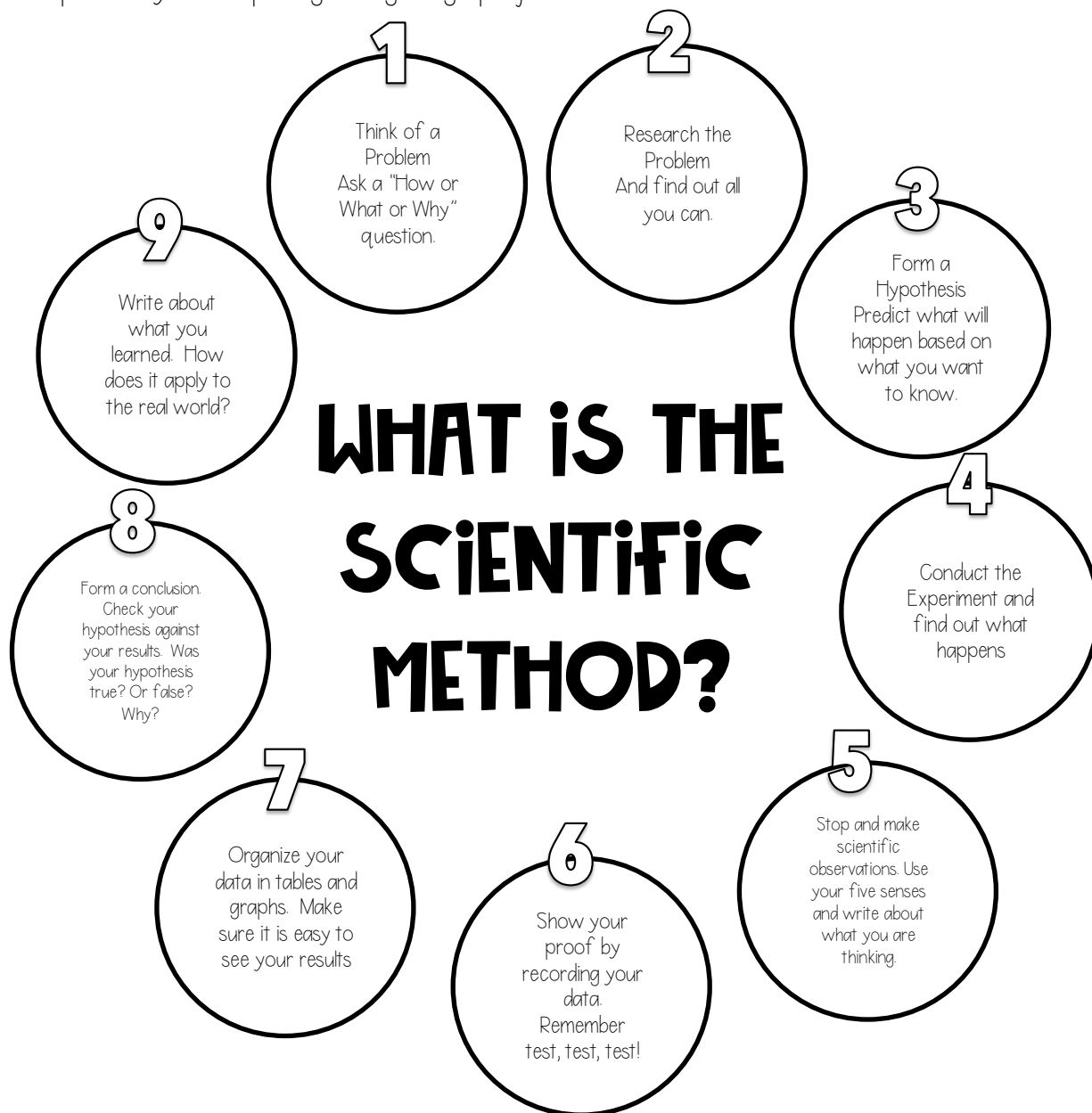
Workbook Section 4 – Wednesday, February 13, 2019

Workbook Section 5 – Wednesday, February 20, 2019

SCIENCE FAIR GOALS

Excellent science educators all agree that students should be given numerous opportunities to practice or “do science.” We hope that Science Fair 2018-19 will:

- Stimulate students’ interest, curiosity, and desire to explore the mysteries of the world.
- Provide students with opportunities to learn, understand, and apply the scientific method.
- Provide real experiences to students so that they would understand how scientific knowledge has been and is still being gathered.
- Encourage the development of essential skills in oral and written communication
- Help students develop skills that involve data interpretation and analysis
- Encourage the acquisition of important research skills using a wide variety of resources such as the Internet, interviews, books, magazines, etc.
- Show a connection between what is learned in the class and what happens in real life.
- Promote unique opportunities for teachers to work individually and collaboratively.
- Foster independence in the student by providing the opportunity for them to take initiative and responsibility in completing a long-range project.



TOPIC, PURPOSE, AND QUESTION

Finding an idea for your project can be the most difficult part of your science fair project. Some students spend more time looking for a topic than doing the actual experiment. Ideas for science fair projects can come from many sources, of course, but the internet is a great place to start to look for topic ideas!

The following websites deal with projects under a specific science discipline:

<p>Agricultural Ideas for Science Fair Projects http://www.ars.usda.gov/is/kids/fair/ideasframe.htm Agriculture usually doesn't get a category at science fairs, but the ideas here for agricultural science fair projects can lead you to projects in botany, chemistry, environmental science, or even medicine.</p>
<p>Interested in Bugs? Science Fair Project Suggestions http://www.si.edu/resource/faq/nmnh/buginfo/scifair.htm Love bugs? Bug Info describes several projects and explains how to conduct them.</p>
<p>Love Math? Math Projects http://camel.math.ca/Education/mpsf/ Math projects, including numbering systems, geometry, game theory, and more, at various levels of difficulty. Some of these ideas are probably best left for high school projects, but some topics include links to helpful reference sites.</p>
<p>Electronics for Kids http://users.stargate.net/~eit/kidspage.htm Here are a dozen projects you can do that will teach you about electricity and magnetism. These are simple and don't require much money or equipment.</p>
<p>Energy Quest Science Fair Projects http://www.energyquest.ca.gov/projects/index.html#chemical Ideas from the California Energy Commission on all kinds of energy topics: Chemical/Stored, Electrical, Geothermal, Hydrological (Water), Nuclear, Solar, and Wind Energy. Also ideas on Saving Energy and Transportation. http://www.pnm.com/sciencefair/investigation.htm If you're interested in energy, here are some questions that can easily be turned into a research project.</p>
<p>Electrochemistry Experiments http://www.funsci.com/fun3_en/electro/electro.htm Learn to measure electrical conductivity and make several kinds of battery. (Did you know you can get electricity from a lemon?) Good projects if you like to work with your hands and build things.</p>
<p>Neuroscience for Kids http://faculty.washington.edu/chudler/experi.html Can your eyes deceive you? Do you remember your dreams? Can you build a model of the nervous system? Dr. Chudler publishes a long list of games and creative ideas for Neuroscience science fair projects. Projects are good for grades 3-12.</p>
<p>Photosynthesis Science Fair Ideas: Arizona State University http://photoscience.la.asu.edu/photosyn/education/sciencefair.html Questions that might help you start a science fair project on photosynthesis. (Not sure what that is? Follow the link to "What is Photosynthesis?") These ideas are just to get you started – you'll have to work out the project yourself.</p>
<p>Earth Science http://interactive2.usgs.gov/learningweb/students/project.htm Learn how to build a table-top model that demonstrates the causes of an earthquake, a model that demonstrates the spreading of the ocean floor, your own weather station, or how to collect fascinating slimes off the rocks in your neighborhood. http://earthquake.usgs.gov/learning/kids/sciencefair.php The U.S. Geological Survey provides a fun list of project ideas for studying earthquakes and other types of ground movement. You can also find instructions for building an earthquake simulator. http://volcano.und.nodak.edu/vwdocs/volc_models/models.html Complete how-to instructions for building several different types of model volcano. Projects for all ages.</p>

From: <http://www.ipl.org/div/kidspace/projectguide/choosingatopic.html>

Here are some more tips for choosing a science fair project topic...

- List your interests. When beginning your search for a science fair project, you should start by making a list of your true interests. After all, you'll be spending a lot of time on this project, so you'll want to find something that you can live with for quite awhile.
- Start by brainstorming some ideas and recording them on a pad. Be sure to keep your mind wide open and ask yourself many questions, like what sort of TV shows intrigue you? What do you like to do in your spare time?
- Find intriguing facts about each topic.
- Once you have finished a list of things that interest you, start thinking about some odd or intriguing facts about each topic. If you do like to grow plants, for instance, or if you just think plants are interesting in some way, ask yourself what intrigues you most. Is it the way they grow? Their potential benefits or harm to humans? Keep brainstorming, jotting down some intriguing facts or ideas related to plants, like the one below. Any of these could lead to a project.
- Research a few topics.
- Once you pick a few topics that sound interesting, do some quick research to find out how feasible your topic will be. Consider things like:

Is there a point that I can prove?

Will this make an attractive display?

Are there visual items I can use for my display?

Can I make a chart from this information?

- Remember, the science fair is a competition, of sorts. Try to select a topic that interests you, but also one that will create an attractive visual experience for the judges.

(From: <http://homeworktips.about.com/od/sciencefair/a/sciencefair.html>)

Coming up with a good question...

Now that you have picked out a topic that you like and that you are interested in, it's time to write a question or identify the problem of your topic. To give you an idea of what we mean you can start off by filling in the question blanks:

The Effect Question:

What is the effect of _____ on _____?

*Examples:

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

The How Does Affect Question:

How does the _____ affect _____?

*Examples:

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

The Which/What And Verb Question:

Which/what _____ (verb) _____?

*Examples

paper towel	is most absorbent
foods	do meal worms prefer
detergent	makes the most bubbles
paper towels	is strongest
peanut butter	tastes the best

Engineering or Technology Question:

What interests me about _____ (noun) is _____?

* Example: How can I make it work (faster or better, at a lower cost or in a new way)

Create your Science fair question using one of the three options above!

PROJECTS TO AVOID

- Effect of colored light on plants (or anything else)
- Effect of music/talking on plants
- Effect of cigarette smoke on plants (ditto) -- NOW FORBIDDEN
- Mold growth
- Crystal growth
- Effect of cola, coffee, etc. on teeth
- Effect of running/music/videogames $\frac{3}{4}$ almost anything! $\frac{1}{4}$ on blood pressure
- Do we eat balanced diets? (data usually unreliable)
- Strength/absorbency of paper towels (and other products)
- Most consumer product testing of the "Which is best?" type -- approach generally without scientific merit
- Graphology
- Astrology
- ESP, especially standard card test
- Basic maze running
- Any project which boils down to simple preference.
- Effect of color on memory, emotion, mood / taste / strength
- Optical Illusions
- Reaction Times
- Many male/female comparisons, especially if bias shows
- Basic *Planaria* regrowth
- Detergents vs. stains
- Basic solar collectors
- Acid rain projects (Important: to be considered, thorough research into the composition of acid rain and a scientifically accurate simulation of it would be necessary.)
- Basic flight tests, e.g., planes, rockets
- Battery life (plug in and run down type)
- Basic popcorn volume tests
- Stills of any kind (PROHIBITED)
- Pyramid power
- Basic flower preservation techniques
- Taste comparisons, e.g., Coke vs. Pepsi
- Smelling vanilla, etc., to improve test scores
- Sleep learning
- Taste or paw-preferences of cats, dogs, etc.
- Color choices of goldfish, etc.
- Basic chromatography
- Wing, fin shape comparison with mass not considered
- Ball bounce tests with poor measurement techniques

RESEARCH AND BIBLIOGRAPHY

You have picked your category and you have chosen a topic. You also wrote a question and now its time to do some RESEARCH!!! You will do so much that you will become an expert at your topic just like real scientist do in real labs.

How do you become an expert?? You READ!!!!

It is important that you read about your topic. You can read encyclopedias, magazines articles and books from the library. Also, read articles from the Internet. Don't forget to take notes of any new things you learn including words so you can use them. It will make you sound like a real scientist!! Keep track of all the books and articles you read, you will need them later.

You DISCUSS!!

It is important to talk about your topic with your parents, teachers, and experts in the field like veterans, doctors, weathermen or others who work in the things you are studying. Sometimes websites will give you an email addresses to experts who can answer questions... But don't forget to ask an adult to supervise before you write to anyone on the Internet. Also, take pictures of any interviews you do with people.

General Guidelines to Formatting a Bibliography

For a book:

Author (last name first). Title of the book. City: Publisher, Date of publication.

EXAMPLE: Dahl, Roald. The BFG. New York: Farrar, Straus and Giroux, 1982.

For an encyclopedia:

Encyclopedia Title, Edition Date. Volume Number, "Article Title," page numbers.

EXAMPLE: The Encyclopedia Britannica, 1997. Volume 7, "Gorillas," pp. 50-51.

For a magazine:

Author (last name first), "Article Title." Name of magazine. Volume number, (Date): page numbers.

EXAMPLE: Jordan, Jennifer, "Filming at the Top of the World." Museum of Science Magazine. Volume 47, No. 1, (Winter 1998): p. 11.

For Online Resources/Internet:

Author of message, (Date). Subject of message. Electronic conference or bulletin board (Online). Available e-mail: LISTSERV@ e-mail address

EXAMPLE: Ellen Block, (September 15, 1995). New Winners. Teen Booklist (Online). Helen Smith@wellington.com

For World Wide Web:

URL (Uniform Resource Locator or WWW address). author (or item's name, if mentioned), date.

EXAMPLE: (Boston Globe's www address) <http://www.boston.com>. Today's News, August 1, 1996.

Finally...

When you think that you can't possibly learn anymore and the information is just repeating itself...

You are ready to...

Form a HYPOTHESIS!!!

HYPOTHESIS AND PROCEDURE

Now it is time to predict what you think will happen if you test your problem...

This type of "Educated Guess" or PREDICTION is what real scientist calls a HYPOTHESIS. This will have you thinking like scientist.

How do you begin?

Well, just answer the following question...

What do you think will happen? (Before you start your experiment)

Example of problem: Which paper towel is more absorbent?

Example of Hypothesis: I think Brand X will be more absorbent because it's a more popular brand. It is thicker and the people I interviewed said that the more expensive brands would work better.

(This hypothesis not only predicts what will happen in the experiment, but also shows that the "Scientist" used research to back up their predictions.)

Designing an experiment is great because you get to use your imagination to come up with a test for your problem, and most of all, you get to prove (or disprove) your Hypothesis. Now Science Fair Rules state that you cannot perform your experiment live, so you'll have to take plenty of pictures as you go through these seven very simple steps.

First: Gather up your materials: What will you need to perform your experiment? The safest way to do this is get that adult you recruited to help you get the stuff you need. Oh did we mention to take pictures or draw pictures of your materials. This will come in handy when you are making your board display.

Second: Write a PROCEDURE: A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well it's like giving someone a recipe to your favorite dish. If they want to try it, they can follow your steps to test if it's true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out. Did we mention to take pictures of your project/experiment (no student faces).

Third: Identify your variables: The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only test one variable at a time in order to get accurate results. In other words, if you want to test the affect that water has on plant growth, then all the plants you test should be in the same conditions, these are called controlled variables: same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you would change from plant to plant would be the amount of water it received. This is called the independent or manipulated variable. The independent variable is the factor you are testing. The results of the test that you do are called the dependent or responding variables. The responding variable is what happens as a result of your test. Knowing what your variables are is very important because if you don't know them you won't be able to collect your data or read it.

EXPERIMENT AND DATA COLLECTION

Now we've come to the good part. The part that all scientists can't wait to get their hands on. . .you guessed it. . . The EXPERIMENT!

Test Your Hypothesis By Doing the Experiment (TEST, TEST, TEST):

Remember that the judges expect your results to be consistent in order to be a good experiment. In other words, when you cook from a recipe you expect the outcomes to be the same if you followed the directions (or procedure) step by step. So that means you need to do the experiment more than once in order to test it properly. We recommend five times or more. More is better! Don't forget to take pictures of the science project being done and the results. Observation is a very important part of this step! Remember to use your five senses to gather information as you conduct your investigation. Then record the information in careful detail. Don't forget to record everything!

Collect your DATA:

This means write down or record the results of the experiment every time you test it. Be sure to organize it in a way that it is easy to read 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. (And, don't forget, it impresses the judges when you use them.) But don't make a graph or table because we asked you to, use it to benefit your project and to help you make sense of the results. There is nothing worse than having graphs and tables that have nothing to do with answering the question of a science project.

CONCLUSION AND ABSTRACT

What is a conclusion?

Your conclusion is a statement of what the results of the experiment were and how that compares to your hypothesis.

What is an abstract?

The Abstract is a summary of your science fair project. Your abstract is made up of a brief statement of the essential, or most important, thoughts about your project. Abstracts should summarize, clearly and simply, the main points of the experiment. Spelling, grammar, punctuation, neatness, and originality are important. It should be 250 to 300 words in length. It is one of the last parts of your science fair project that you will complete. It is an easy part if you are using a computer to record and type your journal entries and other parts of the project. If you are using a computer, then you will only have to cut and paste this information into the abstract.

What should be included in the abstract?

- Your projects purpose statement.
- The hypothesis
- A description of your variables and the control / constants.
- A description of what variable you are manipulating (changing) in your experiment.
- How you went about measuring and observing the variables / controls.
- Your results and data collected from your experiment.
- Your conclusion

Complete the following statements as a guide to writing your abstract:

The purpose of my science fair project was _____. My hypothesis for this project was _____. The constants and controls in my experiment were _____. The variable in my experiment was _____. The way that I measured the responding or dependent variable was _____. The results of this experiment were _____. The results show that my hypothesis should be (give brief reason why to accept or not) _____. If I were going to do this experiment again in the future or expands _____ experiment I would _____.

Sample Abstract

Do Vitamin A Tablets Affect Plants?

The purpose of this project was to determine if Vitamin A tablets have any effect on tomato plants. A total of twelve Rutgers tomato plants each two inches tall were planted in the same individual plastic pots using two cups of potting soil. Each plant received the same amount of water and sunlight during the 3 week experiment. The twelve plants were divided into four groups of three plants each. One vitamin A tablet was added to each of the three plants in the first group by burying the tablet one inch from the stem and one inch deep. Two vitamin A tablets were added to the second group of three plants in a similar manner. The third group of three plants had three tablets planted in the soil. The fourth group of three plants had no vitamin A tablets added to the soil and served as the control group. The height of each plant was measured and recorded at the start of the experiment and every 7 days thereafter. At the end of the experiment (21 days) the stems were cut across at a height of 3 inches. Experimental groups showed less development and slower growth rates than plants in the control group without the Vitamin A tablets. The data was analyzed and the conclusion was drawn that giving vitamin A tablets to tomato plants did not improve growth as each of the three experimental groups failed to produce plants that were taller or had thicker stems than those in the control group.

Sample Abstract

What Is the Effect Of Surface Finish On Rocket Drag?

The objective of this project was to determine if surface finish has an effect on the drag of a model rocket. I believe that a model with a smooth surface will have lower drag and will reach higher altitudes. Five model rockets with identical size and shape, but different surface preparations, were constructed. One rocket was left with an unfinished surface, three had surfaces finished to various degrees of smoothness, and the fifth rocket had its surface sealed, primed, sanded to 600 grit, painted, and covered with clear gloss. The rockets were ballasted to weigh the same and flown 10 times each with B5-4 motors. The rocket with the clear gloss finish consistently reached the highest altitudes of all 5 rockets, while the unfinished rocket consistently reached the lowest altitude. This project provided evidence that surface finish has an important role in model rocket drag and rockets with carefully prepared surfaces will reach higher altitudes.

FINAL PROJECT - DISPLAY BOARD

SCIENCE FAIR DISPLAY BOARD

The function of a backboard is to inform judges and visitors, but also to attract as many spectators as possible. To make it easy for spectators and judges to understand your research, you want your backboard to be clear and eye-catching. Make headings stand out, use neat, colorful headings, charts, and graphs. You might want to include photographs of important parts/phases in your investigation. You are free to choose your colors and format, but there are a few aspects judges are looking for. Your backboard must include:

TITLE

Your title is an extremely important attention-grabber. A good title should simply and accurately present your research. Avoid making your title too long. Write several titles on paper and think about them for a few days before making a final decision. The title should make the casual observer want to know more.

PURPOSE or QUESTION

A question or statement showing what you are trying to find out. Formulate your question very specific, including the subjects to be tested and the variables you will be measuring.

ABSTRACT

A brief, written explanation of the research project, consisting of a succinct description of the project's purpose, the procedures followed, the data collected, and the conclusions reached.

A clear and simple summary statement of the main points of the experiment

A self-contained statement that must make sense all by itself.

HYPOTHESIS

The hypothesis is a prediction of the outcome you expect from your investigation. Just as in your question, formulate the hypothesis very explicitly. Include the subjects to be tested, the experimental variable you will change and the variable you will measure.

MATERIALS

List your equipment, chemicals, foods, and other materials used during your experiment. Include the amount you used of each, using proper units (metric units if possible).

PROCEDURE

The procedure is a list of steps followed during the experimentation or investigation. Make sure to use proper language grammar and spelling. Refer to any experiment in your science textbook for an example of appropriate wording.

EXPERIMENT and DATA COLLECTION

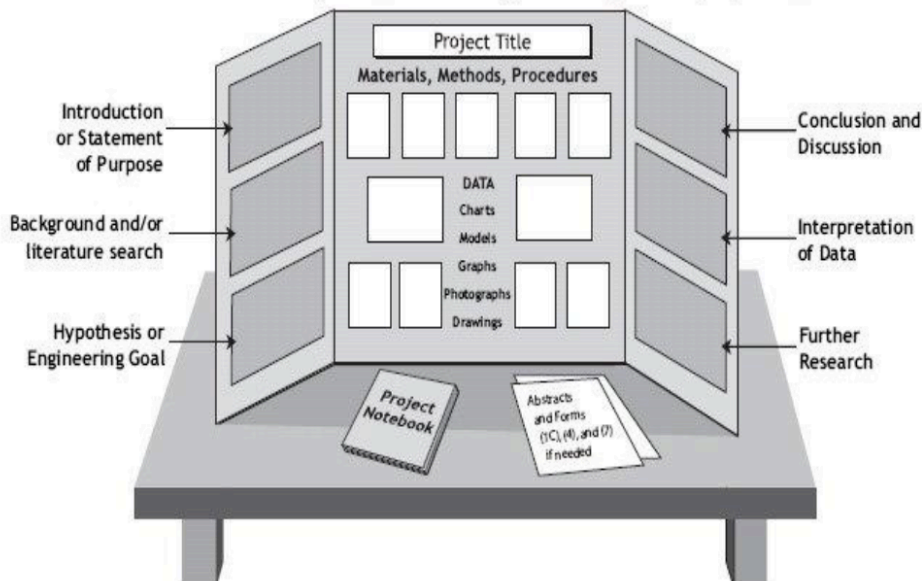
These are the data collected in the investigation. As a scientist, you must keep record of everything you are doing in a notebook. Follow these suggestions for keeping a notebook: Use a sturdy and permanently bound notebook. Date all notes. Complete notes are an absolute necessity. Don't rely on your memory. Write up all work, including failures. It is important to write in pen and to not erase anything or remove pages from your notebook. Something that seems an error now, may turn out to be correct later.

Include the notebook with your exhibit, so you can refer to it during the judging. Judges will be impressed by a complete and well-organized data book.

CONCLUSION

The conclusion is a summary of the most significant results of the project. Be specific, do not generalize. You could suggest what your next step would be or how you would improve the project.

Material Normally Included on a Typical Project Display Board



NOT ALLOWED IN PROJECT DISPLAY

Anything which could potentially be dangerous to the public is NOT allowed to be included in your Science Fair display, including, but not limited to, the following list:

- No living organisms, including plants
- No taxidermy specimens or parts
- No preserved vertebrate or invertebrate animals
- No human or animal food
- No human/animal parts or body fluids (for example, blood, urine)
- No plant materials (living, dead, or preserved) that are in their raw, unprocessed, or non-manufactured state (exception: manufactured construction materials used in building the project or display)
- No laboratory/household chemicals, including water (exception: water that is integral to an enclosed apparatus)
- No poisons, drugs, controlled substances, hazardous substances or devices (for example, firearms, weapons, ammunition, reloading devices)
- No dry ice or other sublimating solids
- No sharp items (for example, syringes, needles, pipettes, knives)
- No flames or highly flammable materials
- No batteries with open-top cells
- No photographs or other visual presentations showing vertebrate animals in surgical techniques, dissections, necropsies, or other lab procedures
- No active internet or e-mail connections as part of displaying or operating the project at the Science Fair
- No glass or glass objects unless deemed necessary by adult sponsor and event chair to be necessary
- No apparatus deemed unsafe by entrant's adult sponsor and event chair (for example, large vacuum tubes or dangerous ray-generating devices, empty tanks that previously contained combustible liquids or gases, pressurized tanks)

Be sure to include a label with the student name, grade level, homeroom teacher on the BACK of the display board.

FINAL PROJECT - RESEARCH REPORT

A Science Fair report is not written the same way a report would be written for an English class. When finished, the written report should be a neatly typed or handwritten summary of your logbook. The written research report should be divided into sections with headings labeled according to the list below.

- **Introduction** – begins with topic, purpose, question and hypothesis, include background research (information needed to understand project) and ends with statement of what was studied in project
- **Materials and Methods** – detailed information so someone could repeat your experiment using lists in a step-by-step format (NOT WRITTEN as paragraph) Be sure to include variables and control
- **Results/Data** – uses data from experiments, in sequence; **include graphs and charts** NOT explaining results
- **Conclusion** – summarize major discoveries found in experiment; EXPLAIN what did or did not happen in your experiment (do not repeat data, DISCUSS it)
 - explain possible sources of errors
 - cite literature to support conclusions
 - DO NOT state hypothesis was proven or disproven, only that data supports or disagrees
- **Abstract** – brief description (paragraph) about what happened during project
- **Bibliography** – list the books, articles, and other sources used for information in your science project

FINAL PROJECT - ORAL PRESENTATION

Each student will give an oral presentation describing how they did their experiment, what they learned, what they would do differently, etc., to their teachers. Students should be comfortable explaining their project. Teachers may also ask questions to clarify their understanding of the process. Each student will have several minutes to discuss their project. Teachers are interested in knowing if the student is knowledgeable about the topic. Can the student explain the project in knowledgeable/scientific terms and explain background information? Can the student accurately interpret the results of the experiment?

Examples of questions a teacher may ask (depending on age of the student):

- Why did you decide on this topic?
- What is the purpose of your project?
- What was your hypothesis?
- Which variable did you change?
- For each value of the variable that you changed (the independent variable), how many trials did you conduct?
- What response did you observe or measure?
- What are some of the things you were careful not to let change (the constants) as you did the experiment?
- What procedures did you follow?
- In your experiment, what was the control? What sample did you use to compare the others with?
- What results did you find?
- What conclusions did you draw?
- How did your results relate to your original hypothesis?
- If you had a mentor, in what ways did your mentor assist you?
- From your library research, what related research did you find that was helpful in conducting your project?
- What would you do differently if you were to do the project again?
- What might you do in the future to continue your project?