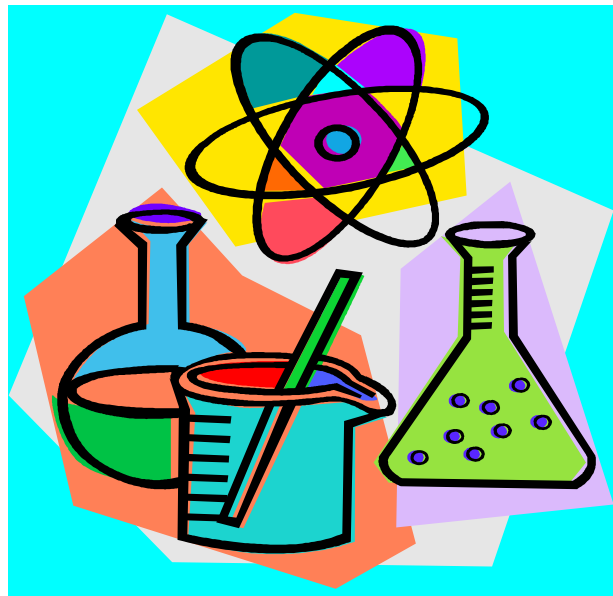
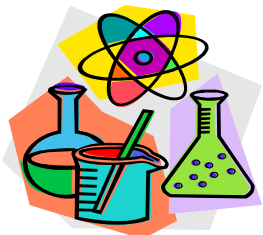


2018-19 St. Mary School Science Fair Guidebook



Come Explore the World of Science!



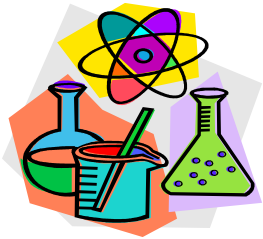
INTRODUCTION

Come Explore the World of Science!

Welcome to the 2018-19 Saint Mary's Science Fair! This guidebook will hopefully provide you with necessary information you need in order to help select, conduct and submit your project. This guidebook may not answer all of your questions; your teachers and the science fair coordinators, Mr. & Mrs. Grossbauer, are available for help.

The guidebook contains the following sections:

- ❖ INTRODUCTION
- ❖ SCHEDULE OF ACTIVITIES
- ❖ SCIENCE CATEGORIES AND DESCRIPTIONS
- ❖ SCIENTIFIC METHOD
- ❖ RESEARCH PLAN
- ❖ REQUIRED FORMS
- ❖ FEEDBACK FORM
- ❖ DISPLAY REQUIREMENTS & RESTRICTIONS
- ❖ JUDGING RUBRIC



SCHEDULE OF ACTIVITIES

Come Explore the World of Science!

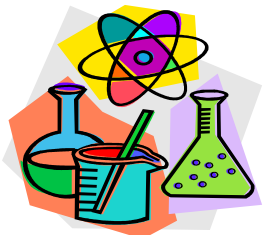
RESEARCH PLANS DUE

PROJECTS DUE

SMS SCIENCE FAIR

MONTCO SCIENCE FAIR

DELAWARE VALLEY SCIENCE FAIR

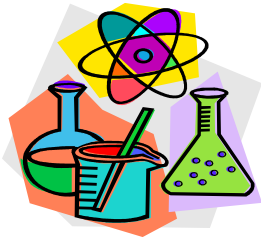


SCIENCE CATEGORIES & DESCRIPTIONS

Come Explore the World of Science!

Here are a number of the many different fields of science. Try to select an area that interests you.

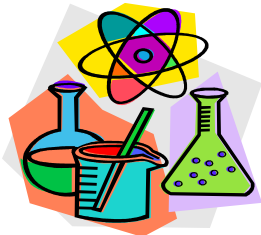
- ❖ Behavioral and Social Sciences - Human and animal behavior, social and community relationships. Psychology, sociology, anthropology, archaeology, learning, perception, urban problems, reading problems, public opinion surveys, educational testing, etc.
- ❖ Biochemistry – Chemistry of life processes – molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones etc.
- ❖ Botany – Study of plant life – agriculture, agronomy, horticulture, forestry, plant taxonomy, plant physiology, plant pathology, plant genetics, hydroponics, etc.
- ❖ Chemistry – Study of nature and composition of matter and laws governing it – physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, fuels, pesticides, metallurgy, soil chemistry etc.
- ❖ Computer Science- Study and development of computer software and hardware and associated logical devices.
- ❖ Earth and Space Sciences – Geology, mineralogy, oceanography, meteorology, climatology, astronomy, geology, speleology, seismology, geography etc.
- ❖ Engineering – Technology projects that directly apply scientific principles to manufacturing and practical uses – civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, heating and refrigerating, transportation, environmental engineering etc.
- ❖ Environmental Sciences – Study of pollution (air, water, and land) sources and their control: ecology.
- ❖ Mathematics – Development of formal logical systems or various numerical and algebraic computations, and the application of these principles – calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability.
- ❖ Medicine and Health – Study of diseases and health of humans and animals – dentistry, pharmacology, pathology, ophthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing etc.
- ❖ Microbiology – Biology of microorganisms – bacteriology, virology, protozoology, fungi bacterial genetics, yeast etc



SCIENCE CATEGORIES & DESCRIPTIONS

Come Explore the World of Science!

- ❖ Physics – Theories, principles, and laws governing energy and the effect of energy on matter- solid state, optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics etc.
- ❖ Zoology – Study of animals – animal genetics, ornithology, ichthyology, herpetology, entomology, animal ecology, paleontology, cellular physiology, circadian rhythms, animal husbandry, cytology, histology, animal physiology, invertebrate neurophysiology.



THE SCIENTIFIC METHOD

Come Explore the World of Science!

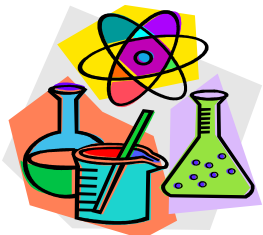
The “scientific method” is a logical step-by-step approach to performing an experiment. It is expected to be used in all Science Fair experiments. The scientific method is comprised of the following steps:

- 1) **Topic:** Find a topic which is interesting to you. Plant growth, friction, electricity, optics, lasers, computer speeds, hearing, paintball accuracy, postal delivery times, absorbency, coin flipping, magnetism, and weather prediction accuracy, are some of the topics that we’ve seen used in prior science fairs. The local library has many books on science experiments which are good to get ideas from.
- 2) **Purpose:** All projects must have a purpose. Think to yourself, “How could the results of this experiment be used?” Could it be used to design a hockey puck which slides farther (friction), help people hear better (listening device), or to help a recycling factory (magnetism)?
- 3) **Research:** Use different sources like the school library, the public library, the internet, or experts. This research will make YOU an expert on your topic, and help you develop a better hypothesis and design a better experiment.

Here’s a website to help with bibliography writing format:

http://www.sciencebuddies.org/science-fair-projects/project_apa_format_examples.shtml

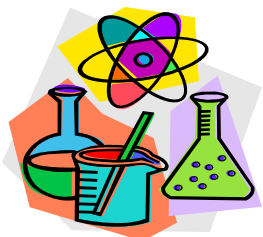
- 4) **Develop a Hypothesis:** The Hypothesis is your prediction to the answer to your question. For example, “I believe that seeds will not germinate without light”.
- 5) **Design the Experimental Procedure:** Write down the step-by-step instructions to perform the experiment. They should be detailed enough that someone else could exactly repeat your experiment. Here are a few “golden rules”:
 - Repeat the experiment enough times so that you are confident in your answers.
 - Find a way to objectively measure the results: time elapsed, distance traveled, inches grown, etc.
 - Change only one variable at a time. Change one “cause” to see its “effect” and measure and record that effect.
 - Include a specific list of materials



THE SCIENTIFIC METHOD

Come Explore the World of Science!

- 6) **Perform the Experiment:** Carry out your procedures. If something unexpected happens, revise your procedures as necessary. Write down all your dates, data, and other pertinent observations in your journal. Keep your ORIGINAL journal.
- 7) **Analyze the Data:** Look at the measurements which you collected. What does it tell you? Graphing the results is a great way to see relationships which aren't obvious otherwise.
- 8) **Draw Conclusions:** What is the answer to your hypothesis? Was it right or wrong? If the experiment wasn't conclusive, what could you do differently next time?
- 9) **Write an Abstract:** A short (less than 250 words) one-page summary of your experiment and its results. This is a paper that someone can walk away with that provides them a way to remember your project. It should include the purpose, summation of the procedure, data and conclusions. The abstract is written **after** the experiment is completed.



RESEARCH PLAN

Come Explore the World of Science!

RESEARCH PLAN

ALL PROJECTS MUST COMPLETE AND SUBMIT A **TYPED** RESEARCH PLAN. THIS RESEARCH PLAN IS DUE TO YOUR TEACHER **ON OR BEFORE** _____

The research plan should contain the following information:

- NAME
- TITLE OF PROJECT
- PROBLEM OR QUESTION BEING ADDRESSED
- HYPOTHESIS / GOAL
- DETAILED DESCRIPTION OF METHOD OR PROCEDURE
 - A. Must include a (typed) copy of any surveys you plan to use
- BIBLIOGRAPHY – 5 References are required for MCSRC
- PARENT / GUARDIAN SIGNATURE

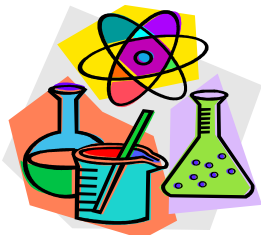
Please understand that your research plan *can be updated* after the initial submittal as you refine your procedures, perform additional research, and conduct your experiment.

PLEASE BE SURE TO INCLUDE ALL THE ABOVE ITEMS IN THE RESEARCH PLAN!!! TYPED PLEASE!!

NEW: There is a template for a research plan on the website. Please take advantage and use it, as it will help insure you don't miss any important parts of the research plan.

FORMS

FORMS (on the SMS website under Activities/Science Fair)



Come Explore the World of Science!

Since we intend to participate in the Montgomery County and Delaware Valley Science Fairs, a number of forms are required.

All students must fill out the forms labeled 1A (comes in individual or team variety) and 1B. These forms need to be submitted along with the Research Plan. Guidance on filling out the forms:

1A: For item 6, the actual start and end dates will be filled in later. For a team project, only one copy of this form needs to be submitted.

1B: Only fill out section 1. If you've read our rulebook, then you can check the first box which discusses the ISEF rules and guidelines; ours match theirs so you'll be good! Each student must submit one, including team projects (a 1B for each student on the team).

HUMAN SUBJECTS

Any experiments that involve people, such as basketball shooting, or involve questioning of people (surveys) are experiments using human subjects.

You may need to obtain a written consent from the people you are testing; we will notify you if that is necessary. If so, a sample consent form can be found on the website.

Any experiment that involves ingestion (eating or drinking) is prohibited due to the risks involved. This also includes smelling, or use of any sort of lotions.

ABSTRACT

You MUST use the Abstract form found on the website for your abstract. Download the form and type your abstract in the box (erasing the words there first); it will limit you to be no bigger than that page.

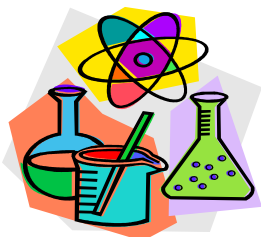
FEEDBACK FORM

OTHER

There may be additional forms required depending upon the particulars of your experiment. The Science team will contact you if other forms are required.

If you have any questions on filling out the forms, please contact either your teacher or the Grossbauers.

FEEDBACK FORM



Come Explore the World of Science!

Student: _____ Magic Number: _____

Project Title _____

Category: _____

Congratulations on completing the research plan. You have taken the first step in your science project. Getting the idea and sketching out the project is usually the hardest part. From now on you can work on researching your project, finalizing your procedures, and performing the experiment.

Above all, please have fun while you do your project. If it is fun and interesting to you, it will also be the best learning experience for you, and it will be the most interesting display for your classmates, friends, and teachers.

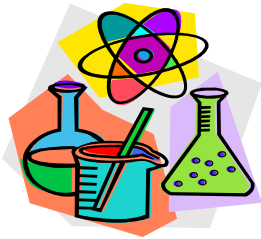
It is okay to change your project a little as it progresses. That is normal! However, if you are going to switch topics, or make major changes, please let us know. It is best to communicate with us by e-mail at joe_grossbauer@msn.com and label it SMS Science Fair. The teachers have e-mail if you don't have it at home.

Here are some specific comments on your project:

DISPLAY REQUIREMENTS AND RESTRICTIONS

Good Luck and Best Wishes,

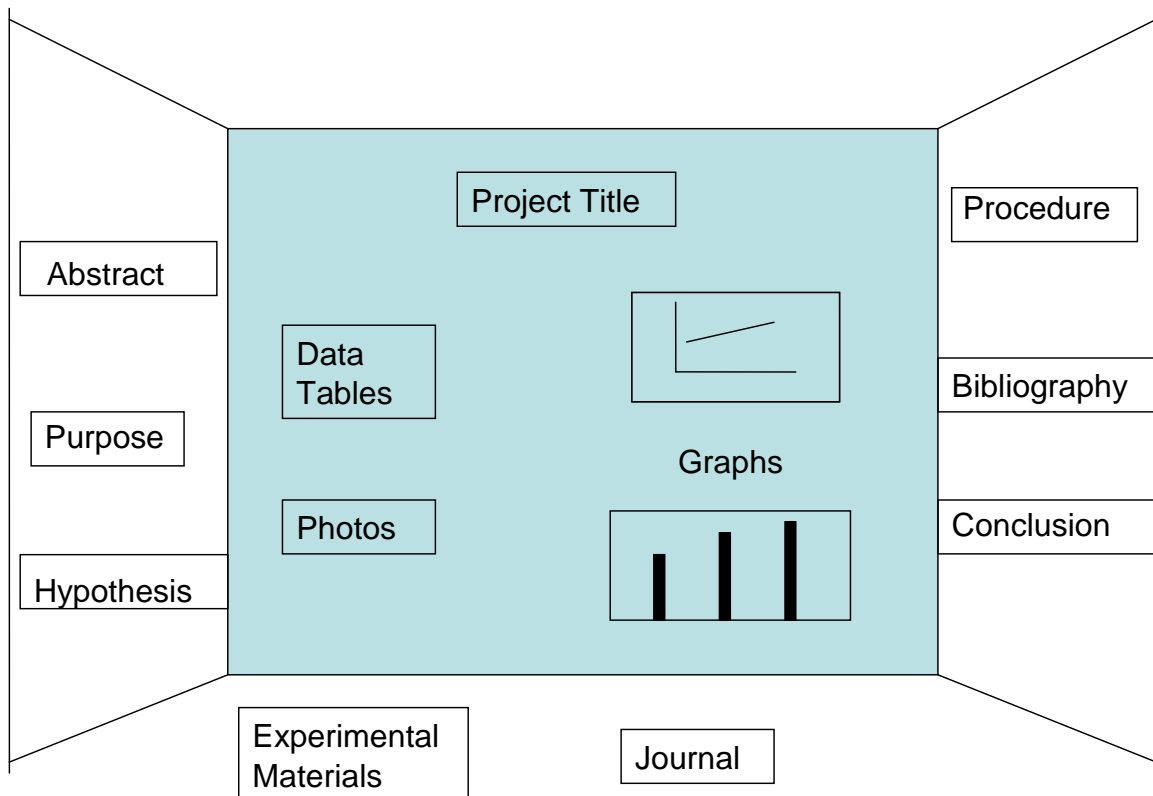
Mr. Grossbauer



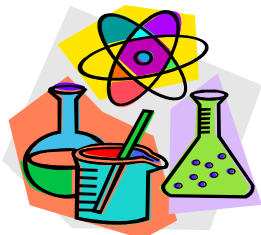
Come Explore the World of Science!

MAKING THE DISPLAY

- ❖ All projects need to be on sturdy display boards. Boards may not be bigger than:
 - 36 inches wide – across the front
 - 30 inches deep – from front to back
 - 48 inches high – from table to top
- ❖ The school's Computer Lab can be used to help create a professional looking report including graphics.
- ❖ The best projects have the elements shown below:
 - ✓ Project Title
 - ✓ Purpose
 - ✓ Hypothesis
 - ✓ Procedure
 - ✓ Journal
 - ✓ Results
 - ✓ Conclusion
 - ✓ Bibliography
 - ✓ Abstract –**Must be in Upper Left!**



Typical Display Setup



DISPLAY REQUIREMENTS AND RESTRICTIONS

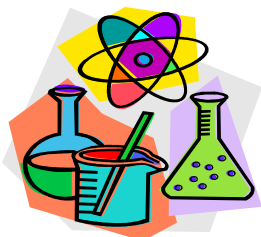
Come Explore the World of Science!

DISPLAY RESTRICTIONS

- ❖ There are a lot of restrictions on materials which can be displayed. Most are common sense but they are listed so that we can ultimately follow the guidelines set out to enter some of our projects in the county/regional science fairs.
- 1) Living organisms including ALL animals, and microbes
 - 2) Taxidermy specimens or parts
 - 3) Preserved vertebrate or invertebrate animals
 - 4) Human or animal food
 - 5) Human/Animal parts or body fluids
 - 6) Waste samples
 - 7) Chemicals including water
 - 8) Poisons, drugs, controlled substances, hazardous substances or devices (i.e. firearms, weapons, explosives, ammunition, reloading devices)
 - 9) Dry ice
 - 10) Sharp items (i.e. syringes, needles, pipettes)
 - 11) Flames or highly flammable display materials
 - 12) Batteries with open top cells
 - 13) Photographs or other visual presentations depicting vertebrate animals in other than normal conditions (i.e. surgical techniques, dissection, necropsies, or other lab techniques)
 - 14) There are limits on our capacity for electrical hook-ups
 - 15) Lasers

ADDITIONAL DISPLAY NOTES

- ❖ Do NOT place the school name anywhere on your display.
- ❖ All measurements need to be in Metric units (kg, cm, etc)
- ❖ If you take and display photos, only use yourself or family members in the photos. If other people are present in a photo, then you technically need a consent from signed by them. *Add a credit line (who took the photo) for the photos.*



JUDGING RUBRIC

Come Explore the World of Science!

Category	10	5	1
Purpose / Problem Hypothesis	<ul style="list-style-type: none"> The purpose is clearly displayed and demonstrates knowledge The hypothesis is clearly displayed and is scientifically testable and reasonable in scope 	<ul style="list-style-type: none"> The purpose is displayed and demonstrates some knowledge Developed a hypothesis but is not reasonable in scope 	<ul style="list-style-type: none"> The problem is unclear and statement has no scientific backing Developed a hypothesis that is poorly stated and/or not scientifically testable
Experiment Design	<ul style="list-style-type: none"> An accurate list of materials Procedures are very detailed and easily followed by anyone without explanation Student clearly understood variables and constants Large # of trials 	<ul style="list-style-type: none"> A list of materials is provided Procedures are listed and could be followed by some people Student has some idea of variables Fair # of trials 	<ul style="list-style-type: none"> No materials list Procedures were seriously incomplete or not sequential Student has no clear grasp on constraints or variables Too few trials
Experiment Conduct	<ul style="list-style-type: none"> Original, detailed log is present Numerous original dates, times, and measurements are in log 	<ul style="list-style-type: none"> Original log is present Some dates, times and measurements are in the log 	<ul style="list-style-type: none"> No log is present Missing dates, times, or measurements
Result Analysis	<ul style="list-style-type: none"> Thorough analysis of results in form of tables, graphs, charts, or pictures Student understood the results and included ideas for further research 	<ul style="list-style-type: none"> Some analysis attempted in the form of tables, graphs, charts or pictures Student attempted to explain the results 	<ul style="list-style-type: none"> Little analysis of results; missing table, graph, chart or picture Student has missing explanation or poor interpretation of results
Conclusion	<ul style="list-style-type: none"> Student provided a detailed conclusion clearly based on the data and related to previous research findings and the hypothesis statement 	<ul style="list-style-type: none"> Student provided a conclusion with some reference to the data and the hypothesis statement 	<ul style="list-style-type: none"> No conclusion was apparent or important details were overlooked
Bibliography	<ul style="list-style-type: none"> A bibliography is included that is correct in form and completed At least 5 references are cited 	<ul style="list-style-type: none"> A bibliography is included At least 3 references are cited 	<ul style="list-style-type: none"> No bibliography is included
Abstract	<ul style="list-style-type: none"> A precise, well written abstract is included that has the purpose, procedure, data and conclusion 	<ul style="list-style-type: none"> Abstract is included that has the purpose, procedure, data and conclusion 	<ul style="list-style-type: none"> No abstract is included
Display	<ul style="list-style-type: none"> Project has a creative title and is eye-catching All items, graphs, etc are neatly and correctly labeled and large enough to see clearly The display is logically organized; easy to follow 	<ul style="list-style-type: none"> Project was somewhat creative and neatly done (some white-out, cross-outs, crooked writing) Most items, graphs, etc. were labeled Display was fairly organized 	<ul style="list-style-type: none"> Project is done in a messy and careless manner. Little attention is paid to detail Graphs, charts, etc are lacking labels Display was unorganized and difficult to follow