
Sixth Grade MERIT



Science Fair Project Guide

*This book will guide you
through the steps of
keeping the science fair
project on track,
recording, reporting and
presenting your findings.*

Name _____

Date _____

Teacher _____



Dear Parents and Students,

Science taught as an inquiry based hands-on approach to learning that aims to tie the classroom to real world problems. We not only teach the basic content, but also the beginnings of basic skills needed for careers in science. Science Fair provides opportunities for student to tackle these real-life problems by using the skills they have been taught in the classroom. We encourage our students to explore an area of science of their interest, perhaps related to a particular career interest and we expect them to become an EXPERT in the topic of their choice. Students will be increasing their knowledge by applying science research skills, such as improvising with their hands, utilize creative thinking skills, testing problem solving strategies, analyzing data and synthesizing information.

Each year science fair is used as a tool to teach our students:

1. **Research Skills:** Students will use world-wide information, connectivity to specialists through various resources, and utilization of a wealth of ideas for preparation of and synthesis into a unique science project.
2. **Logical and Creative Problem-solving:** Students will learn to solve problems logically and to use creative and or alternate solutions to situations encountered during the research project phases.
3. **Critical Thinking:** The students will identify and clarify research issues by following a line of reasoning; judging statements, conclusions, and observations of others before applying information and techniques to own research project.
4. **Communication Skills:** Students will communicate information, ideas, problems, and solutions of the independent research project through verbal, written and visual means.
5. **Self-direction Skills:** Students will use computer skills, graphics skills, determination, goal setting, and organization for information gathering, analysis, synthesis, and evaluation during the Science Fair process.
6. **Creative Thinking Skills:** Students will use techniques such as brainstorming to generate ideas for unique and/or original research-based directions

What is the role of the parent?

- Provide support and motivation for your child.
- Make sure that your child understands the time involved and the materials needed to complete the project.
- Encourage your child to communicate difficulties or needs for extra support to the teacher.
- Help monitor the progress of the project.

What is the role of the teacher?

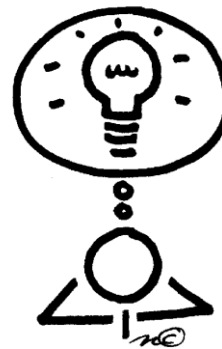
- Help students select a project that interests them and is appropriate for their grade level.
- Monitor the completion of appropriate forms and assignments.
- Provide feedback during the completion of the project.

Let's Begin!!

Step 1: Finding a topic and formulating a research question

Often the most difficult step; keep the following ideas in mind:

- Choose a topic you like and your parents approve.
- Narrow topic to a single aspect and plan your time wisely.
- Projects need to be as original as possible.
- Stay away from consumer products testing! I also recommend NO vertebrates or humans. If you have a project idea that you want to do, I will consider. But you will have to convince me of its worth.



What categories am I interested in? (Circle 2 or 3 from the list below)


1. **Animal Sciences**—Study of animals and animal life, including the study of the structure, physiology, development, and classification of animals. Animal ecology, physiology, animal husbandry, cytology, histology, entomology, ichthyology, ornithology, herpetology, etc.
2. **Behavioral and Social Sciences**—The science or study of the thought processes and behavior of humans and other animals in their interactions with the environment studied through observational and experimental methods.
3. **Biochemistry**—The study of the chemical substances and vital processes occurring in living organisms, the processes by which these substances enter into, or are formed in, the organisms and react with each other and the environment.
4. **Cellular & Molecular Biology**—The study of the structure and formation of cells.
5. **Chemistry**—The science of the composition, structure, properties, and reactions of matter, especially of atomic and molecular systems.
6. **Computer Science**—The study of information processes, the structures and procedures that represent processes, and their implementation in information processing systems. It includes systems analysis and design, application and system software design, programming, and datacenter operations.
7. **Earth and Planetary Science**—The study of sciences related to the planet Earth (Geology, mineralogy, physiography, oceanography, meteorology, climatology, speleology, seismology, geography, atmospheric sciences, etc.)
8. **Engineering: Materials & Bioengineering**—The application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical machines and systems.
9. **Engineering: Electrical & Mechanical**—The application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, processes, and systems.
10. **Energy & Transportation**—The study of renewable energy sources, energy efficiency, clean transport, and alternative fuels.
11. **Environmental Management**—The study of managing man's interaction with the environment.
12. **Environmental Sciences**—The analysis of existing conditions of the environment.
13. **Mathematical Sciences**—The study of the measurement, properties, and relationships of quantities and sets, using numbers and symbols. The deductive study of numbers, geometry, and various abstract constructs, or structures. Mathematics is very broadly divided into foundations, algebra, analysis, geometry, and applied mathematics, which includes theoretical computer science.
14. **Medicine and Health Sciences**—The science of diagnosing, treating, or preventing disease and other damage to the body or mind.
15. **Microbiology**—The study of micro-organisms, including bacteria, viruses, prokaryotes, and simple eukaryotes and of antibiotic substances.
16. **Physics & Astronomy**—Physics is the science of matter and energy and of interactions between the two. Astronomy is the study of anything in the universe beyond the Earth.
17. **Plant Sciences**—Study of plant life. Ecology, agronomy, horticulture, forestry, plant taxonomy, physiology, pathology, plant genetics, hydroponics, algae, etc.

Probe the selected topics to find ideas to research and possible questions that you would like to test. Put your ideas below:

When writing a research question, be sure to include the independent and dependent variables. Ex: How does temperature (IV) affect the rate of photosynthesis (DV) in algae?

Topic : _____

Research Question 1:



Research Question 2:

Research Question 3:

Step 2: Explain the problem and discuss its relevance

What is your science fair project about? How did you come up with the idea? How will answering the problem be helpful?

Have your teacher and guardians approve your topic before going any further.

_____ Parent Approval

_____ Teacher Approval

Once it is approved, you must put your topic and question in your log book (bound journal).

Step 3: Critically investigate the problem

You must include a minimum of 5 sources. Be sure to paraphrase and include the citation. This information must be recorded in your log book! This will be used to write your background research report about the topic. The background research report will later serve as the introduction to the science fair paper!

Research general information about my topic. Ex: if I am trying to find out how temperature affects photosynthesis, then I first need to find out everything I can about how photosynthesis works. Then, move to more specific details of your project.

Background Research Report



The background research report is a written document containing the actual research done about the science fair topic. The research is important because this information “educates” the student so that a formal hypothesis can be formed. This information is also important when writing the experimental procedure.

The requirements are:

- The initial paragraph should discuss the chosen topic and the purpose behind the selection of that topic. Discuss the impact it could have on the science world in general.
- The body paragraphs should include the actual research. Be reminded that at least 5 references should be used! At least one of the five references should be a book.
- The concluding paragraph should be the student’s thoughts about the outcome of the project. This would be the formal hypothesis. Be sure to support the reason for this “guess”.
- The paper should include a bibliography. This should be cited properly. Students may use the MLA format or the APA format.

As always, when writing a formal paper, the paper should be double-spaced, contain one inch margins, 12 point standard font! You may only use either Times New Roman, Trebuchet, or Calibri fonts.

Due Date _____

Step 4: Write a procedure for testing the hypothesis. Remember that each step of your procedure should begin with a verb. Be sure to include specific details. Ex: type of soil used, amount of soil, containers used, type of plants, number of plants, how will you run the experiment, how will you collect data (measuring with a metric ruler in cm, massing in grams, counting, timing in seconds)? (*Data **must** be **quantitative** and you **must** use the SI system of measurement!*)

Question: _____

Hypothesis: _____

Independent Variable: _____

Dependent Variable(s): _____

Controlled Variable(s): _____



Materials: _____

Procedure:

1. Gather materials.

Last step. Analyze data and communicate results.

_____ Teacher Approval
_____ Date

Once procedure is approved, record it in your log book.

Safety First! You need to make a risk assessment of your project. Make a list of any potential hazards. Record this in your log book after you write procedure.

1. _____
2. _____
3. _____
4. _____
5. _____

Step 5: Complete the Appropriate Approval Forms:

All students will complete the following:

- **Form 1**
- **Form 1A**
- **Form 1B** (Only complete the information in #1. You and a parent must sign the form (be sure you read the Ethics Statement). The dates for your signatures must be before you begin experimentation.)
- Research Plan – not an actual form, directions for typing this document are below:

The research plan for ALL projects is to include the following:

A. Question being addressed Make sure your question meets the following criteria:

- Does it interest me?
- Can it be answered through experimentation or investigation?
- Are necessary equipment/supplies available to me?
- Is it useful to find out?

B. Hypothesis/Problem/Engineering Goals

- Make your hypothesis an IF/THEN statement to show exactly what you are testing and what you expect to find.
- Make your hypothesis a TESTABLE statement.
- NEVER change your hypothesis after experimenting. Remember, it is an educated guess. The reason for a hypothesis is to remind you of the goal of your investigation. It forces you to think and plan before you begin.
- Your hypothesis should include the reasoning behind your prediction. Support your point of view with expert information.

C. Description in detail of method or procedures (The following are important and key items that should be included when formulating ANY AND ALL research plans.)

Procedures: Detail all procedures and experimental design to be used for data collection

Data Analysis: Describe the procedures you will use to analyze the data that answer research question or hypothesis

D. Bibliography: List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review.

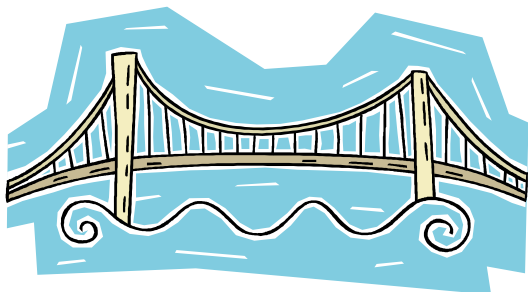
If you are working with humans, animals, or hazardous materials, additional information will be required in your research plan. See your teacher for details.



Step 6: You are now ready to gather materials and begin testing!

- A. Will I need to get permission to use the school's labs or other facilities? Are there any special materials that will need to be order through a science company? Will I need to check out any lab equipment?
- B. Projected start date: _____ Projected end date: _____
- C. Before beginning the experiment, make tables for recording your results in your log book or in a digital spread sheet.
- D. Did you stick to your original research plan? Or did you have to make adjustments?

Justify adjustments that were made to your original research plan:



Step 7: Analyze Data

Data from trials will be averaged and graphed. Bar graphs work best for data that has been counted; line graphs compare independent and dependent variables; pie charts compare parts of a whole.

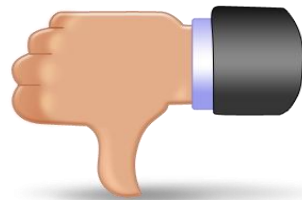
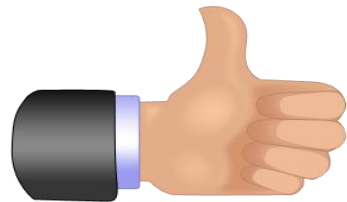
Conduct statistical analysis of data: find average, mode, mean, etc.

Print and paste graphs and charts and put them in your log book.

Step 8: Evaluation

Evaluate the success of the experiments in an objective manner based on the results of testing. Be specific.

What problems did I encounter? If I had to do it again, what changes would I make? What aspects of your project worked well? Was there constancy with your data from each trial(Why or why not)?



Step 8: Conclusion/Discussion

What conclusions can be drawn from the outcomes of your experiments? Was the hypothesis supported or rejected? How do these conclusions impacts life, society and/or the environment?

Step 9: Abstract (See rubric)

Abstracts must be typed on the official abstract form, must be less than 250 words, and written in third person, past tense. The abstract will be displayed with your project backboard. This form is found at the same location as the approval form you have already completed at the UGA web site. *Warning: there are many other forms out there, so please go the UGA site!*

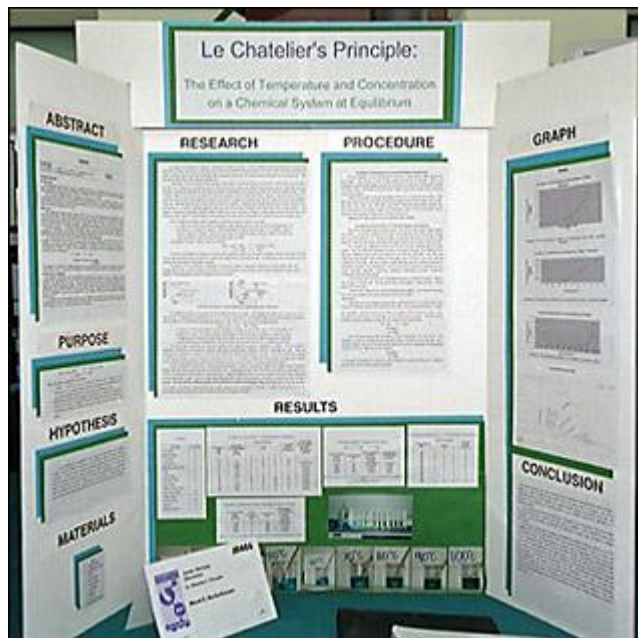
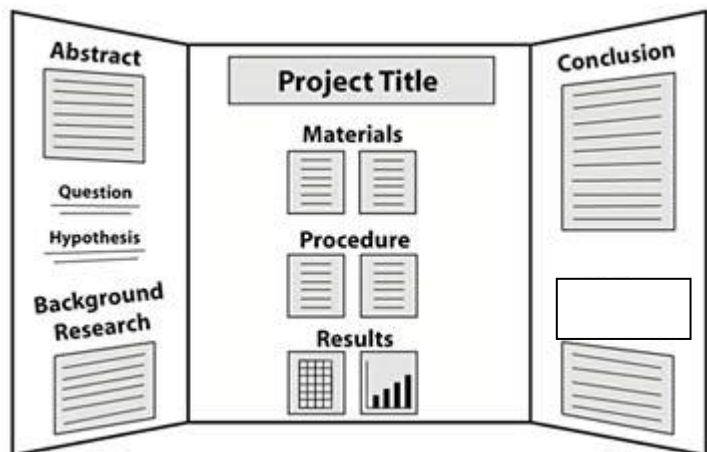
Step 10: Type the science fair paper (See rubric)

This should be an easy task, since most of the paper has already been written. Follow the rubric carefully on the next pages.

Step 11: The Display

Your display should attract and inform. Make it easy for readers to assess what you have done and the results you have obtained. Use your limited space well with concise language and compact visuals. Make headings stand out to guide your reader through your research. Make all text and graphics large enough to read from several feet away. Display data in graphs and include photographs. Do not cut out your research paper and paste it on the board. The display is just a summary of your work!

Examples:



Be sure to write captions under pictures and graphs!

Background Research Report

Background Research	Content	Information is complete, contains inaccuracies and is not clear 20	Information is complete, but is not state clearly 30	Information is complete, accurate, and stated clearly 40
	Conventions	Basic punctuation tends to be omitted, haphazard, or incorrect; frequent spelling errors; capitalization is inconsistent or incorrect; errors in grammar or usage interferes with readability and meaning; substantial need for editing 10	Punctuation, spelling, and capitalization are generally correct; occasional lapses in correct grammar or usage; moderate need for editing 15	Correct capitalization; correct grammar and usage contribute to clarity and style; very little need for editing 20
	Presentation	Garbled message due to problems relating to the presentation; very difficult to read and understand; major distractions; random or confusing layout; did not follow format at all 10	Message is understandable at times; appears empty, fussy, or cluttered; consistent layout; followed format somewhat 15	Enhances the ability for reader to understand and connect with message; pleasing to the eye; formatting suits purpose; followed format 20
	Format	Paper includes very few of the formatting requirements. 10	Paper includes some of the formatting requirements. 15	Paper is double spaced, one inch margins, 12 point type, standard font 20
	Comments:		Total Points:	

Abstract Rubric

The abstract should be completed after experimentation and typed on the official form which is available at the same website as other forms. Use the rubric below as a guide for completing the abstract. Include the information below in one blocked paragraph!

Abstract	Format	The abstract contains only one of the important formatting elements. 5		The abstract is on the official form and is less than 250 words. It is written in third person and past tense. 10	Total Points: Comments:
	Title	The title contains none or only one of the important elements. 5		The title is limited to 65 characters and spaces. It is brief and descriptive. (The same title must be used for all forms and displays.) 10	
	Problem	The statement of the problem contains none or one of the important elements. 5		The statement of the problem tells the reader what specific questions are addressed in the study. The variables and limitations are identified. The intent and objectives of the research effort are made explicit in this statement. 10	
	Purpose	The purpose of the project is not mentioned. 7	The purpose of the project is mentioned, but is not clear. 10	The purpose states the usefulness of the study. It answers the question why the project was undertaken. 15	
	Hypothesis	The hypothesis is not focused and clear. 7		The hypothesis is clear and focused. It limits the scope of the investigation and unifies the research design. 15	
	Procedure	The procedure is not mentioned 5	The procedure is mentioned, but is not clear 7	A brief summary of what was done is provided. (This is not a step by step procedure.) 10	
	Data	There is no mention of any data 7	Some data is mentioned, but it is not clearly summarized 10	The data is summarized in a clear and understandable way 15	
	Conclusion	There is no clear, reasonable conclusion 7	The conclusion contains some of the important elements. 10	The conclusion provides a concise statement of the outcomes of the investigation. It is written in nontechnical language and relates directly to the hypothesis. The conclusion identifies unsolved aspects of the original problem or identifies any new problems. 15	

Name _____

Research Report Rubric

The research report should be in a notebook (three-ring binder). It should contain the following information (in the order indicated). Each section should begin on a new page. Use 1 inch margins and 10 or 12 pt. type. The title page may include larger type.				Total Points:
Original abstract & forms	Abstract and forms are very incomplete or not included. 5	Abstract and forms are incomplete. 7	Original abstract & forms present and completed. 10	Comments
Title page & table of contents (separate pages)	The title page and table of contents are not complete or not included 5	The title page and table of contents are present, but are not very helpful in following the paper. 7	Title page and table of contents present. The TOC allows reader to follow the organization of the paper quickly. 10	
Introduction	Very few or none of the elements of an introduction are present. 5	Some of the elements of an introduction are present. 7	The introduction includes the background information, hypothesis, problem, and explanation of what prompted the research. 10	
Materials & methods	The methods and materials are not described clearly. 5	Some of the elements of the description of materials and methods are present. 7	The method used to collect data and/or make observations is described in detail. The description is detailed enough that someone would be able to repeat the experiment from the information. 10	
Results	The data are missing or very incomplete and unorganized. 5	The data are included, but is not in an organized way. 7	The data and/or observations are listed neatly and clearly in tables and graphs. 10	
Discussion	Only one or none of the elements of a good discussion are present. 7	Some of the elements of a good discussion are present. 10	The results are compared with expected results. Possible errors are included. Ideas for other experiments are discussed. 15	
Conclusion	Only one or none of the elements of a good conclusion are present. 5	Some of the elements of a good conclusion are present. 7	The conclusion is a brief, specific summary of results. 10	
Acknowledgments	No acknowledgments are given. 0	Acknowledgments are present, but incomplete. 3	Individuals, businesses, and educational or research institutions that provided assistance are credited. 5	
References/ bibliography	References are not included. 0	References are listed, but not in an appropriate format. Not enough references used. 7	References are listed in an appropriate format. 10	
Presentation	Very few of the directions for completing the research report were followed. 5	Some of the directions for completing the research report were followed. 7	Directions (see top of page) for completing the research report were followed. 10	

Name _____

Backboard Rubric

Items to be displayed with backboard— Notebook with originals of required forms and research paper, logbook, & abstract	None of these items are displayed with the backboard 0	Only one of the three items is present 3	Only two of the three items are present 6	All three are present 10	Total Points: Comments:
Title	Not present 0	Not easy to read and not clear 3	Easy to read or clear 6	Easy to read and clear 10	
Background information & question	Not present 0	Not easy to read and not well developed 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
Purpose	Not present 0	Not easy to read and not well developed 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
Hypothesis & Independent and Dependent Variables	Not present 0	Not easy to read and not well developed 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
*Materials & Methods	Not present 0	Not easy to read and not well developed 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
*Results	Not present 0	Not easy to read and not developed 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
*Conclusion	Not present 0	Not easy to read and not clear 3	Easy to read, but not well developed 6	Easy to read and well developed 10	
Overall Appearance		Not neat, attractive, nor easy to follow 6	Somewhat neat, attractive, and easy to follow 12	Neat, attractive, and easy to follow 20	

***No credit will be given for Materials & Methods, Results or Conclusion if you do not show proof/evidence that the experiment was actually completed. This can be easily accomplished by taking pictures of you working on the experiment. If a survey was used, then you must provide the surveys. If you built a model, then you should bring a model to display or at least a picture of the model with you in it.**