Annual
Christian Homeschool
Science and Engineering Fair

HANDBOOK

And I applied my heart to seek and to search out by wisdom all that is done under heaven. Ecclesiastes 1:13

Table of Contents

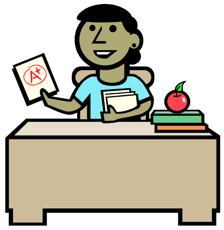
Adapted from the 2013-2014 Miami Dade Elementary School Science Fair Guidelines

Introduction

The Homeschool Science and Engineering Fair is a local homeschool co-op-sponsored activity that supplements the regular curriculum of instruction. The fair administrator and judges have the responsibility to regulate the content and presentation of all student projects to assure that they are consistent with the rules set in place in this handbook. The purpose of the Homeschool Science and Engineering Fair in Coffee County, TN is to encourage students' interest in science, to develop their inquiry and investigation skills, and to enhance children's ability in completing research projects. Science fairs:

- Enable students to exhibit their projects and share ideas with other students and community members;
- Provide opportunities for students to receive feedback from teachers, scientists, and community members;
- Provide students with exciting opportunities to work with science process skills and the scientific method on a topic of their own choosing that relates to the science curriculum as it connects to real life.

Science Fair Rules and Guidelines



1. Individual or team projects (up to 3 students) are allowed.
2. Only two types of projects may be entered into the Fair. They are a scientific investigation or an invention.
3. Projects must fit in one of the 11 science fair project category criteria listed in this handbook.
4. No mold growth, or bacteria projects are allowed.
5. No use of vertebrate animals is allowed except for human observational projects.
6. No use of prescription drugs, harmful, or illegal substances are allowed. Grocery items (i.e., baking soda, vinegar, salt, lemon juice, etc.) are appropriate.
7. Project display boards must follow safety guidelines listed in this handbook.
8. Projects must be approved by the Homeschool science fair representative.

Project Selection and Approval

1. All project ideas must be submitted to the Homeschool science fair representative on a Project Proposal form (see example on page 26). The proposal should contain a topic and problem statement for the project. Projects must follow the science fair rules and guidelines outlined in this handbook. Projects without prior approval, projects inconsistent with the prior approved proposal, or projects that have been substantially changed from what was previously approved will only be displayed at the Science Fair representative's discretion.

Homeschool Science and Engineering Fair Categories

Physical Science: Projects that study the nature and properties of nonliving matter, energy and/or force and motion.

Behavioral Science: Projects that observe the behavior of invertebrate animals. **The use of vertebrate animals** is not allowed except for human observational projects (example: Do boys have a faster reaction time than girls?).

Botany: Projects that use subjects such as plants (mosses, seed plants), agriculture, conservation, and forestry. Live plants may be displayed. Experiments using **mold or fungi** are **NOT** allowed.

Chemistry: Projects that examine chemical reactions, the chemistry of living things, photosynthesis, solubility, heat capacity, etc. **No prescription drugs, dangerous or illegal substances should be used** in the experiments.

Earth and Space Science: These are projects investigating principles of geology (for example, weathering and erosion), geography, astronomy, meteorology, and related fields.

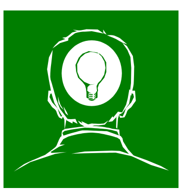
Engineering: Projects can develop technological devices, which are useful to the global society within an engineering related field, such as electricity, mechanical, chemical, aeronautical, and geological.

Environmental Science: Projects that deal with global change, issues related to Earth, such as water, air, climate, waste and pollution, green living, human health, ecosystems and related fields.

Medicine and Health: The project's emphasis will be on human health. (STUDIES ARE LIMITED TO OBSERVATIONAL PROJECTS ONLY.)

Zoology: Projects that observe and record the growth or behavior of animals **(INVERTEBRATES).** VERTEBRATE STUDIES ARE LIMITED TO OBSERVATIONAL PROJECTS ONLY.

Mathematics: Projects are developed that demonstrate any theory or principal of mathematics.



Inventions: projects that uses design and engineering processes to find a practical solution to a problem that addresses a need that exists for people in general or a person with a specific handicap.

Types of Projects

1. **SCIENTIFIC INVESTIGATION**: In this type of experimental project you ask a question, construct a hypothesis, **test your hypothesis using an experiment** and draw conclusions from your experiment. It involves using the scientific method. It must follow an experimental design.

   A. **Experiment:** In this kind of investigation, your purpose is to change something (test or independent/manipulated variable) and record the outcome of this change (outcome or dependent/responding variable). EXAMPLE: Which material, aluminum foil or plastic wrap, will insulate cold water better?

   B. **Experiment with a Control Group**: This kind of investigation involves a more complex investigation that is designed to test the effects of a single condition or factor on a system. For example, you might have a group of plants as an experimental group and another group of the same type of plants as a control group. The test or independent variable in this experiment is the amount of chemical fertilizer added only to the experimental plant group. No fertilizer would be added to the control group. Both the control group and the experimental group would have the same constants (the normal conditions) such as amount of water and sunlight. The outcome or dependent variable is the difference observed in the growth of the plants.

2. **INVENTION**: In this type of project you design and engineer a practical solution to a real problem. It is something that no one has ever thought of before. It cannot be purchased in a store or found in a book. Sometimes an invention is an improvement to an object that was already invented. You can think of a need that exists for people in general or a person with a specific handicap. Then think about a device that could make a difficult task easier or think of an inconvenience that could be made easier with a simple device. For example, if you do not like searching for the cellular phone or TV remote every day, consider developing a homing beacon for it. Invention guidelines begin on page 18.

Scientific Investigation Project Guidelines

THE SCIENTIFIC METHOD:

1. Asking a question.
2. Forming a hypothesis.
3. Designing an experiment.
   a. Identifying variables
   b. Developing procedures
   c. Gathering materials and equipment
4. Collecting data.
5. Analyzing the data.
6. Forming a conclusion.

Step 1 – Choose a Topic and Problem Statement

Begin by exploring a scientific concept that you are interested in. This can be something that was read about or was introduced in your studies. Go to the library or internet to learn more about your topic. Write a brief summary of the background information you gather for your science fair topic. Keep a record of where the background information came from. This information will be listed in your bibliography in Step 12.

- At this point, start asking "What **if**...." questions. One of these questions is what you will use to design your experiment. It is called the "**TESTABLE QUESTION**". This will become your problem statement. Make sure that this has been approved by your parent/teacher.
- Anything to do with your project should be recorded in your lab notebook.

Step 2 – Form a Hypothesis

Once you have a testable question, you have some decisions to make that should be recorded in your lab notebook.

- How do you design the experiment to answer your question?
- What measurements do you need to take to record your results?
- Think about what might happen in your experiment. This is called a **HYPOTHESIS**. Write down what you think will happen BEFORE actually doing the experiment.
- Be specific.

Step 3 – Experimental Design

The experimental design is a plan to test your hypothesis. This is not a specific item on your display board; but it is determined by what your hypothesis is, the variables (test or independent, outcome or dependent, and control) and the materials that you need and the procedures that you will carry out.

Step 4 – Materials/Equipment

Now that you have planned your experiment, gather all the materials you will need to do the experiment. As you begin the experiment, make detailed observations of what is happening. Take your measurements carefully. Keep written notes about what you do and how you do it. Display a list of materials used in column form with quantities/units identified. Make sure materials are available.

Step 5 – Procedure

Write a detailed description of how to do your experiment. As you work through it, you may find that you have to change it. Make notes and change your procedure afterwards, to show the changes. Remember, any scientist should be able to take your procedure and repeat your experiment following your instructions.

- It is easier to use a numbered list, like in a cookbook rather than write a paragraph.
- Start each sentence with an action verb: mix, stir, get, measure, etc.
- Include quantities or amounts that you will measure using metric units.

Step 6 – Variables and Control Group

- Identify the **test variable** (independent/manipulated). This is the variable that you are changing on purpose in your experiment to observe what will happen. For example; the temperature of the water or the battery strength.
- Identify the **outcome variable** (dependent/responding variable), this is the one that reacts or changes in response to the **test** or independent/manipulated variable, i.e., amount of salt that dissolves or number of paper clips held by a magnet.
- Identify the **constant variables** in your experiment. These are the variables in your experiment that you do not change so that you can compare the effects from only one **test** (independent/manipulated) **variable**. Constant variables are quantities that a scientist wants to remain the same or be held constant. Most experiments have more than one constant variable. Some people refer to controlled variables as "constant variables."
- Use a **control group** if applicable in your experiment. A control group is the group that does not receive the experimental variable. Both it and the experimental group have what is usually considered normal conditions, i.e., room temperature, normal amount of water, normal amount of sunlight (constants). A control group helps you to be sure that what YOU DO in your experiment is affecting the test results.

Step 7 – Experiment

- Design a data table to keep track of your results.
- Carry out your experiment following your written procedures.
- Observe and record the results in a data table using metric units i.e., centimeters (cm); grams (g); or degrees Celsius (˚C).
- If qualitative observations are made, a numbered scale must be developed to quantify the observations.
- Use photographs whenever possible to record observations. **(NO FACES IN PHOTOS).** These can be shown on the display board.

Then, ***REPEAT THE EXPERIMENT*** at least two more times. Record your results as carefully as you did the first time. ALL scientists repeat their experiments; All experiments must have a minimum of three trials.

Step 8 – Results

- When you have all of your results, you need to design the way that you will report the data.
- Many students use graphs, charts and written summaries of what happened in the experiment.
- Determine averages or the mean when appropriate.
- Use photographs whenever possible to show changes **(NO FACES IN PHOTOS).**
- Display all your data in charts, graphs, and/or pictures even if it does not match what you thought was going to happen under the heading Data on your display board.
- Explain your results in words and display this narrative under the heading Results on the display board.

Step 9 – Compare your results with your Hypothesis

Look again at your **HYPOTHESIS** and at the results of your experiment. Think about what happened and why it happened that way. Determine if your hypothesis was supported or not supported. You will use your observations to help you write your Conclusion in the next step.

Step 10 – Draw Conclusions

Answer the following questions to summarize what you have learned from the experiment.

- What was the purpose of the investigation?
- Was your hypothesis supported by the data? (Indicate evidence and reasoning that supports your conclusion. This is called Conclusion Evidence Reasoning (CER).
- What were the major findings? What are possible reasons for the results?

Step 11 – Applications

Answer the following questions to complete the Application.

- How can you use the findings from this investigation in your day-to-day life? How can the investigation be improved?
- What new question(s) has your experiment lead you to ask that could be tested in a new investigation.

Step 12 – Abstract and Bibliography

The abstract is a complete summary of the investigation and must consist of three to five paragraphs with a total of approximately 250 words that includes the following.

- Describe your purpose and hypothesis. Briefly describe your procedure.
- Describe and explain your results and state if your hypothesis was supported or not by the results. Suggest a reason why it was or was not supported.
- Explain your conclusion and application(s).

It's important to cite your sources for a science fair project. Put your bibliography of at least 3 different sources on the same page. Here are some examples of how to cite books, online references, and conversations.

1. Here is an example for a book or magazine -- Jones, Jenny R., "Science Experiments to Try" *Science Time*, New York: Sterling Pub. Co., May 2004, Vol. 3:12-15.
2. Here is an example for a Web site -- Helmenstine, Anne, About Chemistry Website, http://chemistry.about.com, Oct. 4, 2005.
3. Here is an example for a conversation -- Smith, John, Telephone Conversation, Mar.5, 2013.

Complete Project Abstract/Bibliography form and submit to your parent/teacher for final approval before working on the science fair display board.

Investigation Project Abstract / Bibliography

Student's Name__ ____

Project Title:____

Abstract

Be sure to include the following in the abstract of a <u>project</u>:

1. The purpose of the project: Why did you choose to do this project or how did you get the idea to do it?

2. State briefly what you thought would happen. Also, describe how you conducted your project.

3. What happened? Tell the results of your experiment.

4. What was the conclusion? Was your hypothesis correct?

5. What are the applications of your project? How can the information you learned be used?

6. How could your project be improved if you were to repeat it? If you were to continue your project, what would you do?

Bibliography

There should be at least three (3) references. If the project concerns an animal, there should be one reference concerning the care of that type of animal.

HOMESCHOOL SCIENCE AND ENGINEERING FAIR

Investigation Project Abstract / Bibliography

SAMPLE

Student's Name: Jorden Web

Project Title: Wrap It Up!

Abstract

The purpose of this project is to determine if increasing the number of wraps around an electromagnet will increase the magnet's strength. It is hypothesized that increasing the number of wraps around the nail will increase the strength of the electromagnet.

Wire, a nail, a D battery, and a battery holder were the materials used to build an electromagnet. The wire was cut 90 cm long so that 10, 20, and 30 wraps could be wrapped around the nail. An electromagnet with 10 wraps was used to pick up paper clips three times. Then using the same steps the electromagnet was built using 20 wraps of wire, tested three times, and then tested with 30 wraps. The number of paper clips collected was recorded in a data table for all the trials.

Results showed that in all three trials, the average number of paper clips picked up the electromagnet increased as the number of wraps increased from 10 wraps to 20 wraps to 30 wraps. The hypothesis was correct.

This experiment shows that the number of wraps of wire on an electromagnet affects its strength, so that in real life if a stronger electromagnet is needed to separate metal from nonmetal objects, its strength can increased by increasing the number of wraps.

The project may have been improved and had better data if a new battery was used for each trial.

Bibliography

Brain, Marshall. How Electromagnets Work. 2000. URL: http://science.howstuffworks.com/electromagnet.htm/printable

ScienceSaurus: A Student Handbook. United States of America: Great Source Education Group. 2005. p. 306

Van Cleave, Janice. *Help My Science Project is Due Tomorrow*. Scholastic. 2002

Investigation Project EXHIBIT GUIDELINES

1. Keep the exhibit neat, uncluttered and to the point.
2. All posters, charts, etc. must be attached to the science fair board.
3. No part of an exhibit may be attached to walls or tables.
4. The science fair board must be self-supporting (FREE STANDING).
5. Be sure to make everything sturdy so it can be safely transported. Fasten everything well.
6. The science fair board displays your project. Use attractive lettering.
7. Use one-color printing to avoid confusion.
8. Spell correctly. Your name and grade should go on the back of the board.
9. Main points should be large and simple. Details must be clear and legible from three feet away.
10. The **abstract and bibliography** must be placed on the board's lower left-hand corner (as you face the board).

EXHIBIT SPACE: Maximum size is: Width: (side to side) 92 cm (36.in) Depth: (front to back) 76 cm (30 in.) Height: Table Exhibit 92 cm (36 in.)

Safety Display Guidelines

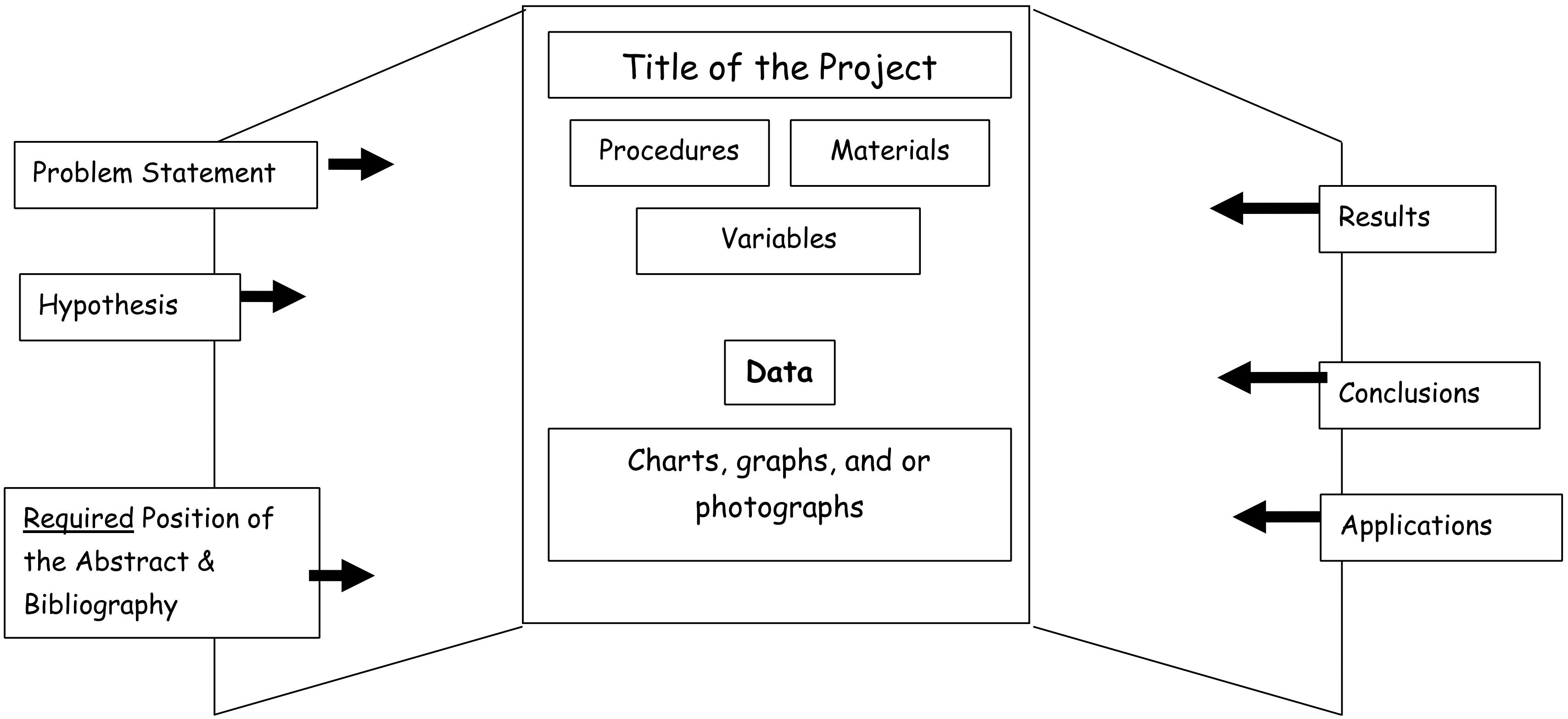
1. Anything which could be hazardous to the public, the exhibitor, or other exhibitors is **PROHIBITED**.
2. Nothing sharp or pointed.
3. Organisms: **No invertebrate organisms** live or dead or plants may be displayed, (Vertebrates, fungi, bacteria were **not** allowed to be part of a project.
4. No chemicals of any kind may be displayed. (**No** prescription drugs, dangerous and illegal substances were allowed as part of the experiment.) For example:
   - No acids, dilute or strong (i.e., vinegar, lemon juice)
   - No bases, dilute or strong (i.e., baking soda)
   - No salt solutions
5. No flammable substances may be displayed.

An alternative solution to displaying any of the above items that were allowed as part of the project is to take photographs of the substances that were used or use a digital camera and create large pictures with a computer printer for display on your board. No faces may be displayed in photos.

<u>All projects will be inspected for adherence to Science Fair Safety Guidelines by the parent/teacher.</u> Failure to follow these guidelines will be grounds for exclusion from the Science Fair.

HOMESCHOOL SCIENCE AND ENGINEERING FAIR

Board Set-up for an Investigation Project



HOMESCHOOL SCIENCE AND ENGINEERING FAIR

Project #: ______________

Judge Number: __________________________

Directions:
Darken circles completely.
Tally total points.
Total Points: _______________

RUBRIC FOR JUDGING INVESTIGATION PROJECTS

1. Abstract & Bibliography To what degree does the abstract and bibliography describe the project and support the research?	0 = No Abstract/No documentation of research 1 = Poorly written and one documentation 2 = Poorly written and two documentations of research 3 = Well-written but does not describe all components of the project 4 = Well-written and completely describes the project	
2. Problem Statement To what degree is the problem statement new and/or different for a student at this grade level and how well is it written?	0 = No Problem Statement 1 = Incomplete Problem Statement 2 = Poorly written or not in a question form 3 = Complete well-written Problem Statement in question form 4 = Above expectations – detailed, well-written in question form	
3. Hypothesis To what degree is this a testable prediction?	0 = No hypothesis 1 = Incomplete hypothesis 2 = Complete hypothesis, but not completely testable 3 = Hypothesis is well-written and testable 4 = Hypothesis is above expectations – detailed, well-written, testable	
4. Procedures - Numbered step by step - Sentences begin with verbs - Quantities to measure are listed in metric units	0 = No overall procedural plan to confirm hypothesis 1 = Partial procedural plan to confirm hypothesis 2 = Sufficient procedural plan to confirm hypothesis 3 = Well-written plan, numbered step by step, sentences beginning with verbs 4 = Well-written as above and detailed including repeatability and specified measurements of materials used in experiment	
5. How well are all variables recognized? -Test (independent/manipulated) -Outcome (dependent/responding) -Control (if applicable) -Constants	**0** = No variables or constants are recognized **1** = Some variables or some constants are recognized **2** = All variables are recognized, but not all constants and controls (if applicable) or vice versa **3** = All variables & constants and controls (if applicable) are recognized 4 = All variables & constants and controls (if applicable) are clearly and appropriately recognized	
6. Materials and Equipment Were the items: - listed in column form - equipment specifically named - metric units are used	0 = No materials identified or used 1 = Materials not specifically identified and/or used properly 2 = Materials specifically identified but used improperly 3 = Materials specifically identified in column form and used properly 4 = Materials specifically identified in column form & metric units used properly	
7. Results To what degree have the results been interpreted?	0 = No written narrative interpretation of data 1 = Partial written narrative interpretation of data 2 = Correct written narrative interpretation of data 3 = Comprehensive narrative interpretation of data including averaging 4 = Comprehensive and significant interpretation of data above expectations	
8. Conclusion To what degree are the conclusions recognized and interpreted? Including: - the purpose of the investigation - hypothesis supported/not supported - the major findings	0 = No problem statement or interpretation of data support for hypothesis identified 1 = Incomplete problem statement or interpretation of data support for hypothesis 2 = Correct/complete conclusion/interpretation of data support for hypothesis 3 = Well-written conclusion/interpretation of data support for hypothesis 4 = Well-written conclusion/interpretation of data support for hypothesis with major findings and possible explanations for them	
9. Application To what degree are the applications recognized and interpreted? Including: -Improvements to the investigation - Use of the findings - New question(s) to be investigated	0 = No recommendations, applications, or new question recognized 1 = Incomplete or vague recommendations, applications, or new question recognized 2 = Apparent recommendations, applications, or new question recognized 3 = Recommendations, applications, and new question clearly recognized 4 = Significant well-written recommendations, applications, and new question recognized	
10. Display Attributes: - free standing - correct grammar/ spelling - clear and legible - attractive visual display	0 = Unsatisfactory quality of display - more than three attributes are missing 1 = Poor quality of display - only two or three attributes are missing 2 = Average quality- only one attribute missing with minor errors and of fair quality 3 = Good quality – all attributes present and with few if any minor errors 4= Superior display – all attributes present and of exemplary quality	

11. Oral Presentation or Interview -How clear, well prepared and organized is the presentation? -How complete is the student's understanding of the experimental work?	0 = Poor presentation; cannot answer questions 1 = Poor presentation; partially answers questions 2 = Fair presentation; adequately answers most questions 3 = Good presentation; precisely answers most questions 4 = Exemplary presentation and knowledge; precisely answers all questions	

INVENTIONS Invention Project Guidelines

1. Each invention must be the product of a single inventor, this means that students may not work together on an invention.
2. Inventions must fit into the following definition:
    - An invention can be anything that solves a real problem. It is something that no one has ever thought of before. It cannot be purchased in a store or found in a book.
    - Sometimes an invention is an improvement to an object that was already invented. An invention must serve a purpose.
3. Inventors are encouraged to use recycled materials.

The Invention Process

The following is adapted from the Connecticut Invention Convention Guidelines.

How do you use creative problem solving to go from problem to invention idea?

Creative problem solving is a process for finding workable solutions to problems. However, finding the right problem to solve is often the most difficult part of the process.

Getting Ideas

It can be said that need is the mother of invention. Your idea for an invention will come from something that you or someone you know needs. There are several ways to find ideas for inventions. One way is to ask if there is anything, they may need.

Another method is called brainstorming. You can brainstorm alone or with others. Here is an example of how brainstorming works. Name an object such as a lunchbox. Take ten minutes to list everything you can that is wrong with lunchboxes. Next, find a way to correct some of the problems. Your ideas for solving the problems can be a big step toward inventing a new or improved product. Keep in mind that your invention does not have to be a product. Instead, it can be a new process for doing something. For example, it may be a better way of memorizing a list of objects or a new card game. Brainstorm a list of possible solutions and record this information. Review the list and eliminate all of the solutions that are impossible and those that already exist. Reasons for eliminating a solution include lack of knowledge, insufficient technical ability, and lack of necessary materials.

Find a Problem

Focus on problems that you may have noticed during your daily life, i.e., opening a can of dog food, reaching the top shelf in your closet, having a place to sit as you wait in line.

Consider the Situation

What do you already know? Focus on originality. If an inventor has an idea, it is important to know what already exists so that the inventor does not waste time "reinventing the wheel." Call around to stores and do research in catalogs to find out if the invention already exists. Your parents may have to help you call stores because they will be taken more seriously. Be sure to record all this information in your log book.

Research and Planning

Before an invention can be successful, you have to make a plan. Your plan should include all the steps you can think of, from beginning to end. When writing your plan, ask yourself questions such as these.

- What can I read about that will help me with my invention?
- Who can I talk to about solving problems and planning properly?
- What materials will I need?
- How can I control the cost of my invention?
- What steps should I follow?
- How much time should I allow for each step?
- How can I test my invention?

Do not be surprised if you have to change your plans along the way. Sometimes a plan will not work as well as you first thought it would. So keep an open mind for change. You may even discover a better way of completing a certain step.

Developing and Testing

Now the work begins. Follow your plan step-by-step. If you have difficulty with a certain part of your invention, find an expert to ask questions. Try different things until you overcome the difficulty. Most of all, do not give up! As Henry Ford, one of the inventors of the automobile, once said, "Failure is only an opportunity to start again more intelligently."

If your invention is a new way to do something, describe your process in a written report. Give all the important details of your process. To show that your idea works, you should test it. The results of your test should be written into your report.

Naming the Invention

Develop a name for your product using the following guidelines:

- Do not make your brand name too similar to others.
- Do not make your brand name too descriptive. You want your name to be a unique eye-catcher.
- Be creative. Brand names that use rhyming or alliteration will grab people's attention. For example; Kit-Kat® or Cap'n Crunch®.
- Remember when you are brainstorming to go for a bunch of ideas.

Invention Display Guidelines

1. Each invention must be accompanied by a self-standing display board.

   Width: (side to side) 92 cm (36 in.)

   Depth: (front to back) 76 cm (30 in.)

   Height: Table Exhibit 92 cm (36 in.) 2.

The Board needs to include the following information:

- The title of the invention
- A description of the problem the invention solves
- A description of how the invention works

3. Each inventor must submit a log or report, which includes the following information:
   - A written statement of the purpose of the invention and the problem it solves.
   - A list of materials used.
   - A list of all the steps taken to complete the invention
   - A description of the problems encountered and include drawings or photographs of attempts that failed
   - A written statement proving originality, in addition to parent verification, students should also describe what they did to ensure that their invention does not already exist
4. Table display space is limited to the area in front of your display board. A working model should represent inventions that are too large for the display.

Please note that failure to follow these invention project guidelines will be grounds for exclusion from the Science Fair.

HOMESCHOOL SCIENCE AND ENGINEERING FAIR

Project or Invention Abstract / Bibliography Form

Student's Name:____

Project/Invention Title:____

Abstract

Bibliography

There should be at least three (3) references. If the project concerns an animal, there should be one reference concerning the care of that type of animal.

ELEMENTARY SCIENCE, MATHEMATICS, ENGINEERING, AND INVENTION FAIR

Invention Abstract / Bibliography

SAMPLE

Student's Name: **Raquel Rodriguez**

Invention Title: **Ear Mutts** **Abstract**

The purpose of this invention is to construct a device that will protect dogs from "swimmer's ear."

It was determined that dogs, like humans, get swimmer's ear, which can be very harmful to them. Swimmer's ear may cause ear infections and more. It was hypothesized that a device could be constructed which would easily fit into the dogs' ears, keeping them dry when the dog swims.

The device was constructed from an adjustable plastic headpiece, which was part of a normal pair of earmuffs. Then a veterinarian was consulted to determine what material could be used to put in a dog's ear that would be painless and harmless to the dog when inserted or removed. A type of earplug was used. It was attached to the earmuff device and tried on different dogs under the supervision of the veterinarian. None of the dogs gave any indication that it hurt to insert or remove, and none of them developed swimmer's ear when they went swimming.

This invention helps dogs and their owners because the dogs are protected from acquiring swimmer's ear. It will allow the dogs to have fun in the water without their owners worrying about swimmer's ear.

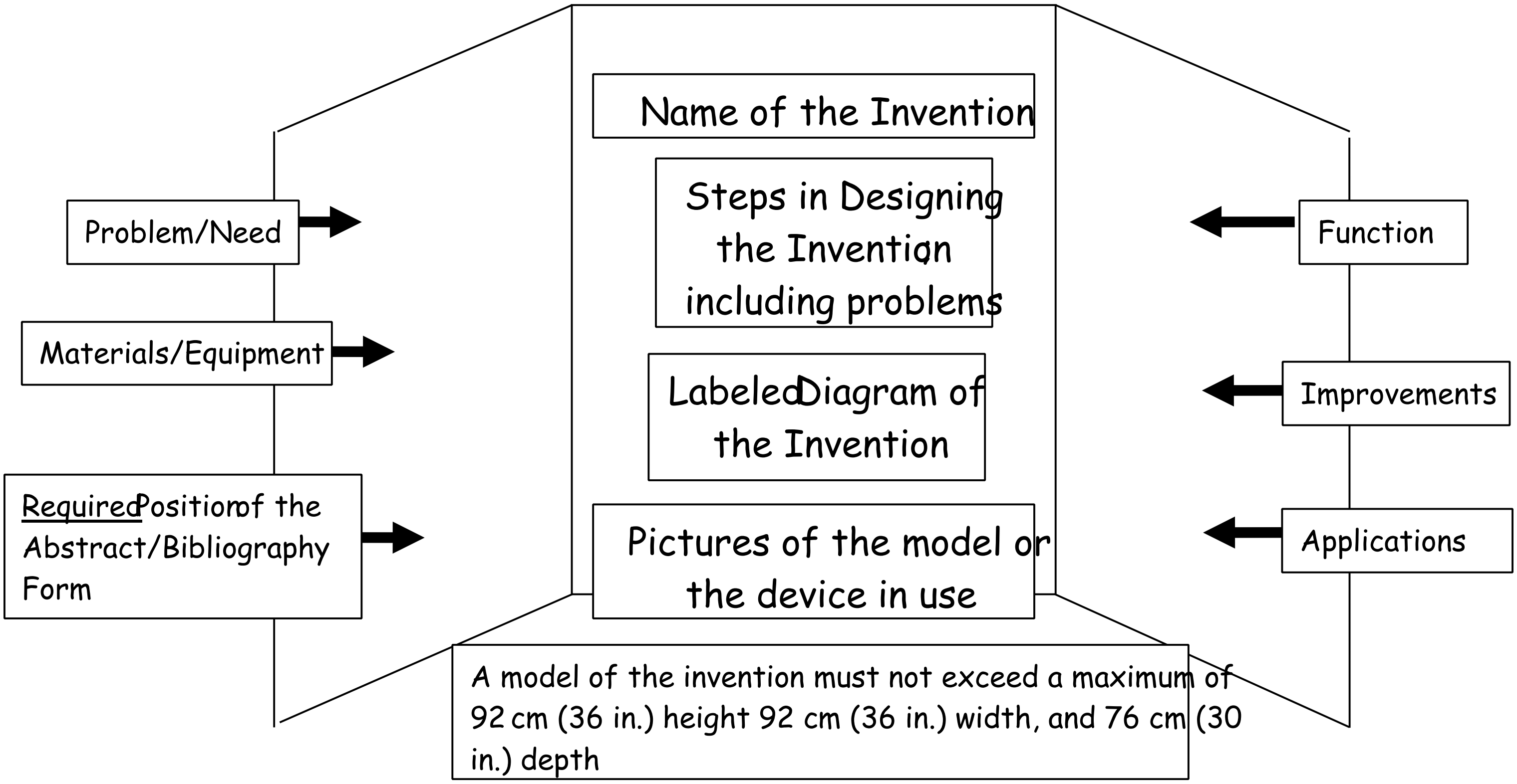
Bibliography

http://bestfriends.com/members/health/canineears1.htm.

Krull, Kathleen, *The Boy Who Invented TV*. McGraw-Hill Reading Wonders Literature Anthology, McGraw-Hill Education, 2014 pp. 86-89

"Students of Invention", *Science & Children.* Vol. 42 No. 1, Arlington: National Science Teachers Association, September 2004, pp. 38-41

Homeschool Science and Engineering Fair
Board Setup for an Invention



The Inventor's Log, a step by step progression of what was done by the "inventor" to make the invention <u>must</u> accompany the invention. A report of background information, and/or a literature search <u>may</u> be submitted with the Inventor's Log

HOMESCHOOL SCIENCE AND ENGINEERING FAIR

Project #: _______________ ***Judge Number:*** ____________________________

Directions:
Darken circles completely.
Tally total points.

Total Points:_______________

RUBRIC FOR JUDGING INVENTION PROJECTS

1. Problem Does the invention identify a problem and address a problem or a need?	0 = No problem to solve or no need for the invention 1 = Poor invention or little need for it 2 = Unoriginal invention, questionable need 3 = Shows insight and address a problem or need 4 = Original, unique project/invention, that addresses or solves a real problem	⓪ ① ② ③ ④
2. Experimental Design Does the design/model of the invention have the functionality and practicality to address or solve the problem?	0 = No design or model to address or solve the problem 1 = Poor quality design, not functional nor practical 2 = Average quality design, functional but not practical 3 = Sufficient quality, functional, practical design 4 = Exemplary quality, very functional, practical design	⓪ ① ② ③ ④
3. Experimental Procedures How complete are sequential steps of the procedures?	0 = Steps in the design of the invention are not listed or are not clear 1 = Steps in the design of the invention are listed but are incomplete or vague 2 = Steps in the design of the invention are clear but hard to follow 3 = Steps in the design of the invention are clear and complete 4 = Steps in the design of the invention are clear, complete, and easy to follow	⓪ ① ② ③ ④
4. Materials/Equipment How were the items utilized in appropriate and/or new ways?	0 = No materials/equipment identified/used 1= Materials not appropriately identified and/or used unsafely 2 = Materials appropriately identified and used safely 3 = Materials carefully identified and used above expectations 4 = Materials carefully identified, used above expectations, and costs kept down	⓪ ① ② ③ ④
5. Scientific Process How well has this experimenter done research and provided evidence to show that no similar project/invention exists?	0 = No documentation of research 1 = Very little documentation of research 2 = Sufficiently documentation of research 3 = Carefully documented, but limited research 4 = Carefully documented with extensive research	⓪ ① ② ③ ④
6. Data Presentation Are there labeled diagrams or data tables, which represent the project/invention?	0 = No labeled diagram(s) or data tables 1 = Partially labeled diagrams or data tables 2 = Unclear or messy labeled diagram(s) or data tables 3 = Sufficiently labeled diagram(s) or data tables 4 = Exemplarily labeled diagram(s) or data tables	⓪ ① ② ③ ④
7. Data Analysis What problems were encountered in the development of the project/invention? What additions could be made to this project/invention to make it better?	0 = No improvements/additions to the invention were attempted 1 = Limited improvements/additions to the invention were attempted 2 = Some improvements/additions to the invention were attempted 3 = Very good improvements/additions to the invention were made during its development 4 = Excellent improvements/additions to the invention were made during its development	⓪ ① ② ③ ④
8. Outcomes Can the function of the invention be easily identified? How well does the project/invention meet the need for which it was created?	0 = The function of the invention is not easily identified and it does not meet the need 1 = The function of the invention can be identified, but the need is not met 2 = The function of the invention can be identified and the need is partially met 3 = The function of the invention is very good and the need is met 4 = The function of the invention is exemplary and the need is completely met	⓪ ① ② ③ ④
9. Project/Invention Design/Construction How well is this invention designed and constructed?	0 = Poorly designed and constructed 1 = Poorly designed or poorly constructed 2 = Adequate design and constructed 3 = Good design and constructed 4 = Well designed and constructed, shows attention to detail	⓪ ① ② ③ ④
10. Visual Display How well is the invention displayed, constructed, and organized? Are spelling and sentence structure correct?	0 = Unsatisfactory quality of display - more than three attributes are missing 1 = Poor quality of display - only two or three attributes are missing 2 = Average quality- only one attribute missing with minor errors and of fair quality 3 = Good quality – all attributes present and with few if any minor errors 4= Superior display – all attributes present and of exemplary quality	⓪ ① ② ③ ④

11. Oral Presentation or Interview -How clear, well prepared and organized is the presentation? -How complete is the student's understanding of the invention?	0 = Poor display, construction, and grammar 1 = One of the following attributes is done poorly: display; construction; grammar 2 = Fair display/construction/grammar 3 = Good display/construction/grammar 4 = Exemplary display/construction/grammar	⓪ ① ② ③ ④

Science Project Proposal Form

Name ____

Problem Statement (The question I plan to investigate in my experiment.)

Science Fair Project Question Checklist		
1.	Is the topic interesting enough to read about and work on for the next few weeks?	Yes/No
2.	Can you find at least 3 sources of written information on the subject?	Yes/No
3.	Can you design a "fair test" to answer your question (problem statement)? In other words, can you change only one variable (test/manipulated/independent) at a time, and control other factors that might influence your experiment, so that they do not interfere?	Yes/No
4.	Can you measure the outcome/dependent/responding variable, which are the changes in response to the independent/responding variable using a number that represents a quantity such as a count, length, width, weight, percentage, time, etc.?	Yes/No
5.	Did you read the science fair rules and guidelines? Is your experiment safe to perform?	Yes/No
6.	Will you be able to obtain all the materials and equipment you need for your science fair project quickly and at a reasonable cost?	Yes/No
7.	Do you have enough time to do your experiment and repeat it at least 2 more times before the science fair?	Yes/No

I have discussed the project problem statement and the checklist with my parent(s) and will commit to completing this project.

____

Student Signature **Date**

Science Fair Student Checklist – Keep in Log Notebook

Student ____________________ Date _____________

Working Plan	Time Line Due Date	Parent's Signature & Date
1. Share letter & packet with parents. Set up a Lab Notebook.		
2. Read packet and sign Project Proposal Form.		
3. Select Topic / Problem Statement. • Identify Manipulated Variable • Identify Responding Variable		
4. Complete topic research. Cite three or more resources. Form a Hypothesis.		
5. Design an Experiment: • Identify Variables/Control • Write Procedures. • List and collect materials. • Create a Data Collection Table.		
6. Perform Experiment: • Collect Data • Take pictures • Create a graph		
7. Analyze Data • Write Results • Compare Results to Hypothesis. • Write Conclusion & Application.		
8. Write the Abstract & Bibliography.		
9. Set up the Display Board.		

Homeschool Science and Engineering Fair
Checklist

☐ Online project registration

☐ Signed Project Proposal Form

☐ Safety Approval Form

Student Participation: Participating students are requested to attend the Homeschool Science and Engineering Fair and be available to provide information about their project to the judges.

Project Set up: Check in/set up will begin at 10:00 a.m. Tables will be provided for each entry. Judging will begin promptly at 11:00 a.m.
Awards and closing ceremony will immediately follow completion of judge's review.

HOMESCHOOL SCIENCE AND ENGINEERING FAIR

SAFETY-APPROVAL FORM

STUDENT'S NAME: ____
(Last Name) (First Name)

CO-OP (if applicable): ____

PROJECT/ INVENTION TITLE: ____

____

HYPOTHESIS/ INTENT OF INVENTION: ____

____

PROCEDURE

(Steps to test the hypothesis or build the invention; this section may be submitted as a computer printout.)

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____

MATERIALS USED TO TEST THE HYPOTHESIS OR BUILD THE INVENTION

(include quantities)

1. ________________________________ 6. ________________________________
2. ________________________________ 7. ________________________________
3. ________________________________ 8. ________________________________
4. ________________________________ 9. ________________________________
5. ________________________________ 10. ________________________________

I have read the proposed Science Fair Project for the above-named student and have approved his/her proposal as safe. The student followed the rules of the Homeschool Science and Engineering Fair and, to the best of my knowledge, was supervised during the development of the project or the invention.

Parent's Name ____ Date: ___________

Parent Signature: ____ Date: __________

Emergency Contact Information for Students participating in

Homeschool Science and Engineering Fair

In case of accident or emergency on the day of the event:

Name of Student: ____

Name of Parent/Guardian: __________________________Cell Phone: ___________

Home Phone: _________________ Emergency Phone: ________________

Co-op Science Fair Coordinator Name: ___________________________________

Co-op Science Fair Coordinator Cell Phone: ____________

Chaperone responsible for student during event (if different from above):

____

Chaperone Cell Phone: _______________ Emergency Phone: __________________

Please print two (2) copies.

Keep a copy for your records

Websites That May Be Helpful for Projects and Inventions:

http://www.sciencebob.com/sciencefair/index.php http://www.invention-help.com/invention-help-books.htm http://pbskids.org/designsquad/pdf/parentseducators/DS_Invent_Guide_Full.pdf (for teachers) http://www.inventivekids.com/2010/10/05/step-by-step-guide-to-inventing/ http://www.sciencebuddies.org http://www.showboard.com http://science.dadeschools.net/ http://www.proteacher.com/110031.shtml http://www.sciedunet.org http://sciencepage.org/scifair.htm http://my.integritynet.com.au/purdic/science-fair-projects-ideas.htm http://www.ipl.org/div/kidspace/projectguide/ http://www.super-science-fair-projects.com/elementary-science-fair-projects.html www.kidsinvent.org www.howstuffworks.com http://edweb.sdsu.edu/courses/EDTEC596/Project1/Inventors.html (teachers only) http://ctinventionconvention.org/ http://library.thinkquest.org/J002783/InvCon.htm http://all-science-fair-projects.com/

Books

Bardhan-Quallen, Sudipta. 2006. *Last-minute Science Fair Projects: When your Bunsen's not Burning but the Clock's Really Ticking.* Sterling Publisher.

Bochinski, Julianne Blair. 2005. *The Complete Workbook for Science Fair Projects.* Wiley Publisher

Brooks, Philip. 2002. *Questions and Answers: How Things Work.* New York: Kingfisher.

Egan, Lorraine Hopping. 1997. *Inventor and Inventing Grades 4-8.* New York: Scholastic Professional Books

Erlbach, Arlene. 1997. *The Kid's Invention Book.* Minneapolis: Lerner Publication Company.

Friedhoffer, Bob. 2006. *Everything You Need for Simple Science Fair Projects*. Chelsea Clubhouse

Gardner, Robert. 2004. *Electricity and Magnetism Science Fair Projects: using batteries, balloons, and other Hair-raising Stuff.* Enslow Publishers.

Gates, Phil. 1995. *Wild Technology: Inventions Inspired by Nature.* New York: Larousse Kingfisher Chambers, Inc.

Harper, Charise Mericle. 2001. *Imaginative Inventions.* Boston: Little, Brown and Company.

Karnes, Frances A. Ph.D and Suzanne M. Bean, Ph.D. 1995. *Girls and Young Women Inventing: Twenty True Stories about Inventors plus How You Can Be One Yourself.* Minneapolis: Free Spirit Publishing.

Rubin, Joel. 2008. *Weather*. Heinemann Library

Sobey, Ed. 2002. *Inventing Toys: Kids Having Fun Learning Science.* Tucson, Arizona: Zephyr Press.

Spangenburg, Ray and Diane K. Mosher. 1997. *American Historic Places: Science and Invention.* New York: Facts On File.

Sullivan, Otha Richard. 2002. *Black Stars: African American Women Scientists and Inventors.* New York: John Wiley and Sons. Inc.

Thimmesh, Catherine. 2000. *Girls Think of Everything: Stories of Ingenious Inventions by Women.* Boston: Houghton Mifflin Books.

Tocci, Salvatore. 2006. *More Simple Science Fair Projects,* Chelsea ClubHouse Publisher.

Van Cleave, Janice. 2002. *Help My Science Project is Due Tomorrow*. Scholastic.