



**2008-2009
Elementary Science Mathematics
Engineering
And
Invention Fair Handbook**

Revised October 2008

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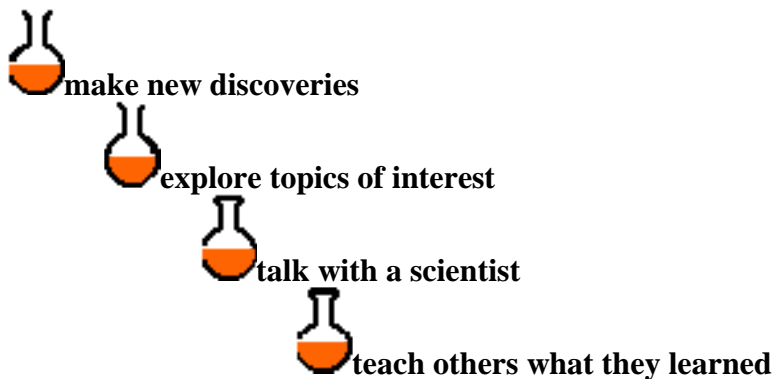
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Sample Registration Form: <http://science.dadeschools.net/scifair/default.htm>

Safety-Approval Form: <http://science.dadeschools.net/scifair/default.htm>

Science Fair participants . . .



have lots of fun learning

Science, Mathematics, Engineering, and Invention Fair Handbook for Elementary Grade Levels

Adapted from Boulder Valley School District

The Elementary Science Fair is a school-sponsored activity that supplements the regular curriculum of classroom instruction. The classroom teacher and school principal have the responsibility to regulate the content and presentation of all student projects to assure that they are consistent with the interests of the school community. The purpose of the Science Fair in Miami-Dade County Public Schools is to encourage students' interest in science, to develop their inquiry and investigation skills, and to enhance children's pride in completing research projects. Elementary-level 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 professional scientists and community members;
- Provide students with exciting opportunities to work with the scientific method on a topic of their own choosing which need not necessarily relate directly to the curriculum at a particular grade level;
- Are non-competitive events and students can be given recognition for participation or merit based on a rubric or set standard, without projects being classified by ranking (i.e., first place, second place etc.); and
- Should adhere to standards of effective scientific instruction. Projects that "fail" to turn out as expected are an important learning opportunity. Experimentation is a very valuable part of learning and "failure" of a project or experiment is considered a valid project for display.

Project Selection and Approval

All project ideas must be submitted to the school on the provided Project Proposal form. The proposal must contain a statement of problem or hypothesis and the proposed procedures for the project. Projects will be approved by the classroom teacher or the school Science Fair Committee. 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 principal's discretion.

In the category of behavioral and social sciences:

- All survey questions must have prior approval of the classroom teacher or school Science Fair Committee and must be administered by the student;
- All survey questions must be approved prior to administering them to students;
- Students must notify interviewees of the purpose for the study;
- Students must conduct the surveys;
- There can be no deceptive use of the results; and
- Prior permission must be obtained from parents to survey minors.

Failure to meet these criteria will be grounds for exclusion from the school Science Fair.

Science Skills Learned and Practiced through Science Fair Participation

Observing - The learner will identify objects and their properties utilizing all five senses, identify changes in various systems, and make organized observations.

Classifying - The learner will sort objects by their properties, match objects by their likenesses and differences, and describe the sub-components of objects.

Measuring - The learner will compare two like quantities where one is used as a unit of measure.

Collecting and Organizing - The learner will gather, describe, and record data and then order, classify, and compare the data to identify patterns and similarities.

Predicting and Inferring - The learner will suggest explanations for a set of collected data and then form generalizations.

Identifying Variables - The learner will formulate a hypothesis from a set of observations and inferences, and devise a method to verify the hypothesis.

Synthesizing - The learner will integrate process skills in the design, experimentation, and interpretation of an investigation of an observable phenomena.

The use of these processes will be continued throughout the secondary level science experience.

Science Fair Categories

- **Behavior Sciences:** Observing the behavior of invertebrate animals, **the use of vertebrate animals** is not allowed except for human surveys and strict observational projects.
- **Botany:** Using subjects such as plants (mosses, seed plants), agriculture, conservation, and forestry are good ideas. No live plants may be displayed. Experiments using mold or fungi may **NOT** be done at home!
- **Chemistry:** Projects examining chemical reactions, the chemistry of living things, photosynthesis, cellular respiration, solubility, heat capacity, etc.
- **Computers:** Demonstrating new ideas for computer software, testing computer systems.
- **Earth and Space Science:** Projects investigating principles of geology, geography, astronomy, meteorology, and related fields.
- **Engineering:** Developing technological devices which are useful to mankind. Also engineering-related fields, such as electricity, civil, mechanical, chemical, aeronautical, and geological.
- **Environmental Science:** Projects dealing with global change, issues related to spaceship Earth, World Earth Day topics, environmental concerns, extinctions, pollution and related fields.
- **Medicine and Health:** Emphasis on human health.
- **Mathematics:** Showing any theory or principal of mathematics.
- **Zoology:** Observing the growth or behavior of animals (invertebrates), genetics, and paleontology. **VERTEBRATE STUDIES ARE LIMITED TO OBSERVATIONAL PROJECTS ONLY!**

TYPES OF PROJECTS

INVESTIGATION: Observe nature (plants, animals, people) and report what you observe. Your purpose is to find out how your specimens behave or function. This type of project should follow the scientific method. Example: Watch prairie dogs; record their barks; photograph their

movements; compare their movements at various times in the day or how their movement is affected by weather etc; then chart or graph the findings.

Comparative Surveys: These surveys are sometimes called natural experiments. Identify two or more groups or classes of subjects that are generally alike but which may show a difference in one or more important factors. Express the difference as a hypothesis. EXAMPLE: "Boys' hearts beat faster than girls' hearts do."

Controlled Experiment: This kind of experimenting involves more complex investigations. EXAMPLE: You might have a group of plants as an experimental subject and another group of the same type of plants as a control group. The independent variable in this experiment is the amount of chemical fertilizer added to the experimental plant group. The dependent variable is the difference observed in the growth of the plants.

Simple Experiment: In this kind of experiment your purpose is to change something. You will be observing what happens as a result of changes. EXAMPLES: Melt an ice cube; incubate an egg; inflate a balloon.

BEHAVIORAL AND SOCIAL SCIENCE: These projects usually involve surveys and/or human observation.

SURVEYS-

- All survey questions must have prior approval of the classroom teacher or school Science Fair Committee and must be administered by the student.
- All survey questions must be approved prior to administering them to students.
- Students must notify interviewees of the purpose for the study.
- Students must conduct the surveys.
- There can be no deceptive use of the results.
- Prior permission must be obtained from parents to survey minors.
- Failure to meet these criteria will be grounds for exclusion from the school and/or district Science Fair.

INVENTION: Think of a need that exists for people in general, or a person with a specific handicap. Think about a device that could make a certain difficult task easier. Think of an inconvenience that could be made easier with a simple device. For example, if you hate searching for the toothpaste tube every morning, consider developing a homing beacon for it. You might want to look at specialty stores.

THE SCIENTIFIC METHOD

When doing an investigation you will want to follow a research method used by scientists when they do experiments.

- Scientific investigations involve asking and answering a question and comparing the answer to what scientists already know about the world.
- Simple instruments, like magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.

- Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigation.
- Scientists review and ask questions about the results of other scientists' work.

Step 1– Decide on a Problem

GET A LOG BOOK! From this point forward, everything should be recorded in your log book!

- Write about your ideas.
- Write about the problems you had and tell how you solved them, or if not, what you did.
- Record all of your observations.
- Basically, anything to do with your project should be recorded in your log book!

Don't forget to put the date on each page!

Begin by exploring a scientific concept that you are interested in. Perhaps it is something you read about or were introduced in your classroom. Think of some kind of experiment that you would like to try. Remember that you must be able to measure the experiment each day.

- Set up a control group and an experimental group. Remember to change only one variable.
- Write down your problem. Make sure that there is a purpose to your experiment.

Step 2 – Form a Hypothesis

At this point, your brain will start asking "What if...." questions. One of these questions is what you will use to design your experiment. It is called the "TESTABLE QUESTION."

Once you have a testable question, you have some decisions to make:

- 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 BEFORE actually doing the experiment.
- Be specific! Make a chart of the numbers that you are predicting and give reasons for your guesses.
- Include other guesses such as height, color, condition, size, time, etc.

Step 4 – Experimental Design

The experimental design is a plan to confirm your hypothesis. This is not a specific item on your display board, but is determined by what your hypothesis is, the materials that you need and the procedures that you will carry out.

Step 5 – 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 carefully written notes about what you do and how you do it.

Step 6 – 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. That's OK, just 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. You may have to make your own scale, i.e., scale for leaf color ++++dark green → + yellow-green.

Step 7 – Variables and Controls

- Identify the independent (manipulated) variable, this is the one that you control, or are changing in your experiment, i.e., temperature of water, amount of light.
- Identify the dependent (responding) variable, this is the one that reacts or changes in response to the independent variable, i.e., amount of salt that dissolves or the height of the plant.
- How do you use constants in your experiment? Constants are the part of your experiment that you do not change so that you can compare the results of your test.
- It is wise to use a control group in your experiment. A control group is the group that does not receive the experimental variable. It has what is usually considered normal conditions, i.e., room temperature, normal amount of water, normal amount of sunlight. A control group helps you to be sure that what you are testing for is really happening because of what YOU DO in your experiment.

Step 8 – Experiment

- Carry out your experiment.
- Make and record observations using a measuring tool (i.e., ruler, thermometer, balance, etc.) whenever possible.
- Record measurements in metric units, i.e., centimeters (cm); grams (g); degrees Celsius (°C).
- Design a data table to keep track of your results.

Then, **REPEAT THE EXPERIMENT** over again at least **two more times**. Record your results as carefully as you did for the first time. ALL scientists repeat their experiments; we **INSIST** you repeat yours as well.

Step 9 – Results

- When you have all of your results, from all the times you did the experiment, you need to design the way that you will report your results.
- Many students use graphs, charts and written summaries of what happened in the experiment.
- Determine averages, mean, mode, or frequency when appropriate.
- Use photographs whenever possible to show changes.
- Display all your results and measurements, even if it doesn't match what you thought was going to happen.

Step 10– 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. Write down the reasons you think the results happened the way they did.

Step 11 – Conclusion

A summary of what your experiment shows and how your work can be used for more research.

- Explain what you learned from your experiment.
- Explain the importance of your results, how it contributes to making something better.
- Try and show an application for your experimental results.
- Write comments about your project. Explain how you could have improved your project.

Step 12 – Abstract and Bibliography

- No more than 150 words.
Paragraph 1 – Describe your purpose and hypothesis.
Paragraph 2 – Briefly describe your procedure.
Paragraph 3 – Describe and explain your results and also state if your hypothesis was supported or not supported by the results. Suggest a reason why it was or was not supported.
Paragraph 4 – Explain your conclusion and application(s).
- Put your bibliography of at least 3 different sources on the same page.

EXHIBIT GUIDELINES

1. Keep the exhibit neat, uncluttered and to the point.
2. All posters, charts, etc. must be attached to the exhibit.
3. No part of an exhibit may be attached to walls or tables.
4. Build your exhibit compactly. It must be self-supporting (FREE STANDING).
5. Be sure to make everything sturdy so it can be safely transported. Fasten everything well.
6. The exhibit displays your project. Use attractive lettering. Make cut-out letters since stencil letters can be hard to read.
7. Use one-color printing to avoid confusion.
8. Spell correctly.
9. Main points should be large and simple. Details must be clear and legible from three feet away.
10. The **abstract/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) 9 cm (3 feet)

Depth: (front to back) 76 cm (2 1/2 feet)

Height: Table Exhibit 92 cm (3 feet)

ELEMENTARY SAFETY 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 organisms** may be displayed, No vertebrates, invertebrate, fungi, bacteria, or plants. For example:
 - Vertebrates- No owl pellets
 - No mice, live or dead
 - No skeletons
 - No fish, live or dead
 - Microbial cultures- No fungi, live or dead
 - No bread molds, bacteria, viruses, viroids, prions, rickettsia, live or dead
 - No parasites, human or other, live or dead
 - No insects, live or dead
4. Chemicals: No chemicals may be displayed. For example:
 - No acids, dilute or strong
 - No bases, dilute or strong
 - No insecticides, repellents
 - No mercury, salt solutions
 - No medicines, vitamins, over-the-counter drugs
5. Flammable substances: No flammable substances may be displayed.
 - No gases
 - No solid rocket fuel
 - No flammable liquids
 - No fumes

An alternative solution to displaying the above items: Take photographs of the substances that were used or use a digital camera or computer printer. Projects must adhere to the Science Fair Safety Guidelines.

Miami-Dade County Public Schools
Elementary Science, Mathematics, Engineering, and Invention Fair INFORMATION
SHEET
Project Abstract / Bibliography

Student's Name: _____

Project Title: _____

Abstract

Be sure to include the following in the abstract of a project:

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

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

What happened? Tell the results of your experiment.

What was the conclusion? Was your hypothesis correct?

Remember, in science even an incorrect hypothesis is important, because it gives information.

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

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.

Miami-Dade County Public Schools
Elementary Science, Mathematics, Engineering, and Invention Fair
Sample Project Abstract / Bibliography

Student's Name: Jane Jones

Project Title: WHICH CHOCOLATE-CHIP COOKIE DO THIRD GRADERS LIKE BEST?

Abstract

The purpose of this project is to determine which type of chocolate-chip cookies third-grade students like best. It is hypothesized that third graders will like the homemade chocolate-chip cookies best.

Cookies were bought at Publix and others were homemade. All third-grade students had previously been given consent forms in order to participate. If someone was allergic to chocolate, he/she was not included in the study. Cookies were put in the same type bags marked A, B, and C. Students were asked to fill out a slip revealing their gender and telling which type of cookie they liked best.

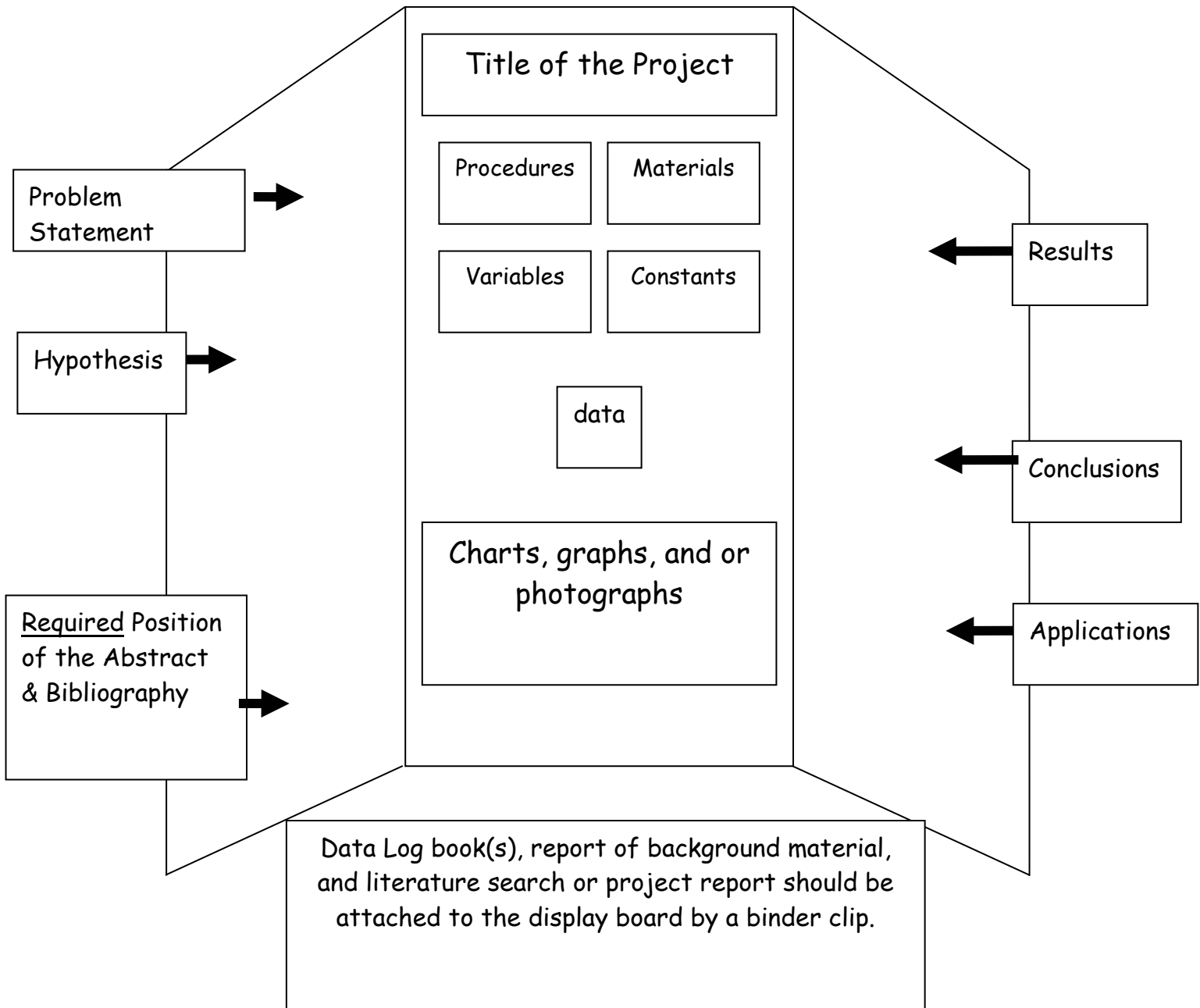
Results showed that third-grade boys liked homemade cookies best and third-grade girls liked *Keebler* cookies best. The hypothesis was not correct. This study could be repeated at different times of the day to determine if time of day has any effect on the choice of third-grade students.

Information from this study may be used for mothers who give cookies to their children. If a mother is planning a happy surprise, the cookies a student likes would be the most desirable.

Bibliography

Nelson, Jim. *Cooking is Fun*. New York: Random House, 1989, p. 95

Elementary Science, Mathematics, Engineering, and Invention Fair Board Set-up for a Project



South Florida Science and Engineering Regional Fair

DIRECTIONS

- Use #2 pencil.
- Darken circles completely.
- Make no stray marks.

PROJECT NUMBER

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

JUDGE'S NUMBER

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

Abstract To what degree does the abstract describe the project?	0 Points 1 Point 2 Points 3 Points 4 Points	lacking an abstract poorly written and does not describe the project poorly written and does not describe all components of the project well-written but does not describe all components of the project well-written and completely describes the project	0-1-2-3-4
Problem To what degree is the problem (trial solution) statement new and/or different for a student at this grade level and how well is it written?	0 Points 1 Point 2 Points 3 Points 4 Points	lacking problem (trial solution) statement incomplete problem (trial solution) statement complete problem (trial solution) statement, but poorly written complete well-written problem (trial solution) statement above expectations for that level – detailed and well-written	0-1-2-3-4
Hypothesis To what degree is this a testable prediction? (Engineering – Does this project have a trial solution or a product to be developed?)	0 Points 1 Point 2 Points 3 Points 4 Points	lacking hypothesis (trial solution) incomplete hypothesis (trial solution) hypothesis (trial solution) is present, but not completely testable hypothesis (trial solution) is well-written and testable hypothesis (trial solution) is above expectations – detailed and well-written	0-1-2-3-4
Experimental Design/Procedure To what degree does the experimental design/procedure test the hypothesis (or objective if an engineering project)?	0 Points 1 Point 2 Points 3 Points 4 Points	no overall procedural plan to validate or confirm the hypothesis partial procedural plan to validate or confirm the hypothesis sufficient procedural plan to validate or confirm the hypothesis well-written procedural plan to validate or confirm the hypothesis exemplary and detailed procedural plan including repeatability	0-1-2-3-4
Variables and Controls How well are the variables recognized and held constant in both the experimental and control groups?	0 Points 1 Point 2 Points 3 Points 4 Points	no variables are recognized or controlled some variables are recognized but are not controlled variables are recognized but not controlled variables and control(s) are recognized variables and control(s) are clearly and appropriately recognized	0-1-2-3-4
Materials/Equipment Were the items utilized in appropriate and/or new ways?	0 Points 1 Point 2 Points 3 Points 4 Points	no materials/equipment identified/used materials/equipment not appropriately identified and/or used properly materials/equipment appropriately identified but used improperly materials/equipment carefully identified and used appropriately materials/equipment carefully identified and used above expectations	0-1-2-3-4
Data Collection/Presentation How well do the charts, logs, graphs, tables and pictures represent the data?	0 Points 1 Point 2 Points 3 Points 4 Points	no quantitative data collected insufficient data collected and displayed sufficient data collected but incompletely/incorrectly displayed sufficient data collected and displayed data collected and displayed above expectations	0-1-2-3-4
Data and Error Analysis To what degree have the results been interpreted? To what degree have the possible errors been analyzed?	0 Points 1 Point 2 Points 3 Points 4 Points	no interpretation of data partial interpretation of data correct and appropriate interpretation of data comprehensive and significant interpretation of data comprehensive and significant interpretation of data with error analysis	0-1-2-3-4
Outcomes/Applications To what degree are the conclusions and/or products recognized and interpreted? To what degree are relationships, new ideas, further research, and/or additional explanations identified and presented?	0 Points 1 Point 2 Points 3 Points 4 Points	no conclusions, products, and/or applications recognized incomplete conclusions, products, and/or applications recognized apparent conclusions, products, and/or applications clearly recognized significant conclusions, products, and/or applications clearly recognized well-written, significant conclusions and future applications clearly recognized	0-1-2-3-4
Display Consider the overall quality of the following three attributes combined: visual display, writing skills, and references (both in bibliography and for pictures).	0 Points 1 Point 2 Points 3 Points 4 Points	poor quality - more than one attribute is deficient below average - only one attribute is deficient OR all attributes are present but of less than fair quality average - all attributes present and of fair quality above average - all attributes present and of good quality superior - all attributes present and of exemplary quality	0-1-2-3-4
Oral Presentation/Interview How clear, well-prepared, and organized is the presentation? How complete is the student's understanding of the experimental work?	0 Points 1 Point 2 Points 3 Points 4 Points	poor presentation; cannot answer questions poor presentation; partially answers questions fair presentation; adequately answers most questions good presentation; precisely answers most questions exemplary presentation and knowledge; precisely answers all questions	0-1-2-3-4

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

INVENTIONS

The following is adapted from the Connecticut Invention Convention Guidelines

Where do ideas for inventions come from?

Where do you think the inventor got the idea for the invention of Velcro?

Returning from a day's hunting, an engineer, Georges de Mestral, noticed that thistle blossoms clung to his clothing and his dog's fur. Under a microscope, he discovered that each of these blossoms contained minute hooks that caused it to attach to fabrics. It then occurred to him to fix similar hooks on fabric strips that would then cling together and serve as fasteners.

Eight years later the basic product was developed: two nylon strips, one of which contained thousands of tiny hooks, the other even smaller loops. When the two strips were pressed together, they formed a quick and practical fastener. The invention was named Velcro from the French words, velours (velvet) and crochet (hook). It was patented worldwide in 1957.

For de Mestral, his idea came from his everyday experience. I bet you have experienced the same incident, but did you come up with the idea of Velcro?

How do you get credit for your invention?

In the United States, the first person to have the idea and to demonstrate a sincere attempt to act upon the idea is awarded the patent, not the person who first applies for the patent.

Don't be a Daniel Drawbaugh!

But for the lack of witnessed notebooks describing the device, the man known as the inventor of the telephone would have been a talented mechanic by the name of Daniel Drawbaugh. Similar disputes have raged over who invented the automobile, the electric light, and the laser, and in all of them, records- or lack thereof- played a deciding role.

The telephone case is a classic example. Even though Drawbaugh was able to produce hundreds of witnesses to testify that he had talked over a crude telephone long before Alexander Graham Bell filed a patent application in 1875, he had not a scrap of paper dating and describing the invention. The Supreme Court rejected his claims in 1888, by the narrow margin of four votes to three.

As the sad case of Daniel Drawbaugh indicates, U.S. patent practice places a premium on witnessed records when two or more parties claimed the same invention. The date the idea occurred (the "conception") and the date it was put into practice ("reduced to practice") are vital.

Equally important in the eyes of the Patent Office is the "diligence" shown by contending inventors. They must prove that they regularly pursued work on the invention, documenting their efforts on a day by day basis.

The Invention Process

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 people if there is anything they 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.

Another way to generate ideas and to modify ideas is the **SCAMPER** technique. Choose a common object, like a paper clip or piece of paper. Use each of the techniques on the common object in order to change it. Then SCAMPER with ideas instead of objects. Example of how to use SCAMPER on a paper lunch bag:

SUBSTITUTE- What if you make the bag from a different material?

COMBINE- What if you combine it with another common object?

ADAPT- How can you adapt the bag to another situation? Is it similar to other objects?

MMAGNIFY, MINIFY, MODIFY- What if I make it bigger, smaller, or change it in some way (tear it, change form, texture, shape, color)?

PUT IT TO OTHER USES- What else can you use the bag for?

EELIMINATE- What could you take away?

RREARRANGE/ REVERSE- Can you rearrange the parts? Can you turn it upside down, backwards, inside out?

Find a Problem

Focus on problems that you may have been 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. Also consider problems that handicap individuals encounter.

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 doesn't waste time "reinventing the wheel." Research the Internet to find out if the invention already exists. Be sure to record all this information in your log book.

Brainstorm

Brainstorm a list of possible solutions and record it in your invention log. 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.

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?

Don't 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 talk to. Try different things until you overcome the difficulty. Most of all, don't 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:

- Don't make your brand name too similar to others.
- Don't 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 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 definitions:
 - *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 cost of the invention must not exceed \$25.
4. Each invention must be accompanied by a self-standing display board;
 - Width: (side to side) 90 cm (3 feet)
 - Depth: (front to back) 76 cm (2 1/2 feet)
 - Height: Table Exhibit 92 cm (3 feet)
5. 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.
 - Inventor's name, grade, and school.
6. 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.
 - Describe 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.
7. Table display space is limited to the area in front of your display board. A working model should represent inventions that are too large.

Miami-Dade County Public Schools
Elementary Science, Mathematics, Engineering, and Invention Fair
Invention Abstract / Bibliography

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 ear muffs. 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 ear plug was used. It was attached to the ear-muff 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.

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**ELEMENTARY SCIENCE, MATHEMATICS, ENGINEERING AND INVENTION FAIR
RUBRIC FOR JUDGING INVENTIONS**

- 1) **Problem for an invention:**
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 invention, that solves a real problem

- 2) **Experimental Design for an invention:**
Does the design/model of the invention have the functionality and practicality to solve the problem?
 - 0 no design or model to validate 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

- 3) **Experimental Procedures for an invention:**
How complete are sequential steps in the design of the invention?
 - 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

- 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

- 5) **Inventing Process:**
How well has this inventor done research and provided evidence to show that no similar process or product 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

- 6) **Data Presentation for an invention:**
Are there labeled diagrams which represent the invention?
 - 0 no labeled diagram of the invention
 - 1 partially labeled diagram of the invention
 - 2 unclear or messy labeled diagram of the invention
 - 3 sufficiently labeled diagram of the invention
 - 4 exemplarily labeled diagram of the invention

- 7) **Data Analysis for an invention:**
What problems were encountered in the development of the invention? What additions could be made to this 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

8) Outcomes for an invention:

Can the function of the invention be easily identified? How well does the 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

9) 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

10) Visual Display for an invention:

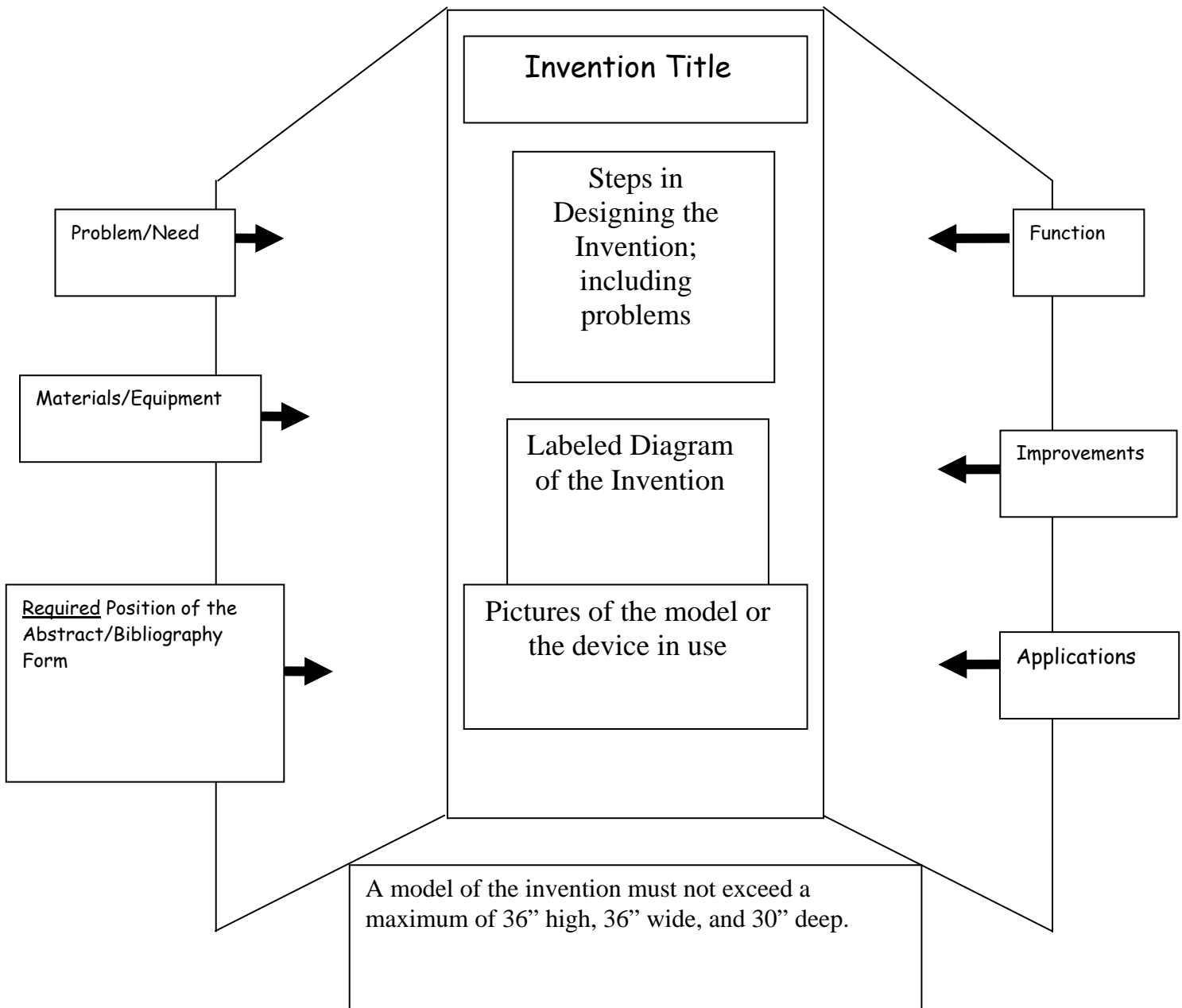
How well is the invention displayed, constructed, and organized? Are spelling and sentence structure correct?

- 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

Please note that there will be no students present during judging, therefore, the items on the judging score sheet referring to “oral presentation” and “interview” will not be included in the scoring

Science Fair INVENTION BOARD

Board Set-up for an Invention



A report of background information, and/or a literature search may be submitted with the Inventor's Log -- the latter being a step-by-step progression of what was done by the "inventor" who makes the invention. The Inventor's Log, must accompany the invention.

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