Madera Science Fair
Grades 4th – 6th

Why participate in the Science Fair?

The features of the Next Generation Science Standards include the use of a conceptual framework; clarification statements to explain the level of rigor expected and connect concepts with applications; concrete links between the standards and assessments; and the development of **inquiry and design processes** to facilitate students in both science and engineering practices.

Scientific practices in the NGSS are the behaviors that scientists engage in as they investigate and build models and theories about the natural world. The NGSS also include engineering practices, which are behaviors that engineers engage in as the apply science and mathematics to design solutions to problems. Scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design.

Cross cutting concepts help provide students with a framework for connecting knowledge from the various disciplines. These concepts are: Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Structure and Function, and Stability and Change. These concepts provide an organizational schema for interrelating knowledge from various scientific fields into a coherent and scientifically-based view of the world.

Engaging in opportunities such as the Madera Science Fair will allow students and families the chance to plan activities and delve deeply into these types of thinking.

At Madera, we encourage all students to participate in the Science Fair.

What kind of project can I do?

4th through 6th graders participating in the science fair must enter a problem solving project or an experiment; no models or demonstrations allowed at these grade levels. These projects give students the experience of demonstrating and practicing their knowledge of the scientific method of problem solving. Students should be able to share their understanding of the project in their own words and be able to explain the results that they achieved.

Where can I get ideas for projects?

Some of the most interesting science fair projects are simple,age appropriate, original experiments that come from the students' own ideas. These projects may answer questions and test a hypothesis in an area of interest such as a hobby, daily activity, cooking, or sport. Thus, your project may come from your own toys, kitchen, or backyard! Maybe you have a question about how to get the best result in a task, or about how something works. Or, maybe you think you know how to get the best result, and you could run an experiment to test this hypothesis and see if you are correct. Once you have an idea, select one independent variable (the thing you will change in the experiment), and one or more dependent variables (the things you will observe and measure). Look for variables that are measureable such as distance, weight, speed, time, volume, area, number of occurrences.

See, for example:
http://www.sciencebuddies.org/science-fair-projects/project_variables.shtml#examples
http://www.jpl.nasa.gov/education/sciencefair/

The WCCUSD Science Fair Project Guide, available at www.maderapta.comor as a hard copy in the office,has a list of 64 example projects as well as other useful tips and information.

The internet, books, magazines, and science museums are also good resources. Remember that there are many different areas of science such as.

- Physical: gravity, magnetism, electricity, motion, color and light, chemistry
- Earth: temperature, weather, energy, pollution, soil
- Biological: plants, food, humans, and animal behavior.

Who can help?

Families can assist students by offering guidance, helping gather needed materials, and providing supervision. The Science Fair Committee will be available to make presentations in classrooms that explain the Science Fair Process, share previous projects, answer questions, and go over the elements of an Inquiry Based Project.

How are projects judged?

Typically two volunteer judges from our scientific community will independently rate eachproject using a judging sheet similar to the example included at the end of this packet.

All 4^{th} – 6^{th} Grade projects will receive a place ribbon and a certificate.

Students should be able to share their understanding of their project in their own words and beable to explain the results that were achieved.

There is no District Elementary Science Fair. No projects will be sent to another level.

Tips for getting started, doing and finishing

- Set target dates for completing certain parts of the project – the earlier the better!
- Make sure you have plenty of time to finish the project. Some projects may take a long time for results to appear. Know how long the experiment will take and schedule accordingly.
- Get ideas from family, friends, books, magazines, Internet, videos, etc.
- Do your research early so that you can adjust your question, hypothesis, or procedures if needed. Remember to write down the sources you used.
- If you need help getting materials or taking photos, let your family know as soon as possible.
- Keep organized! Put all of your work together in a folder of a large envelope and keep it in a safe place.
- **Repeat the experiment at least twice.** This lets you compare the results from each time to make sure that your results were accurate. Also, making a conclusion from similar results is a lot easier. Results that are not similar may point to a flaw in the procedure.

Science Fair Project Checklist:

- **Student's name, grade, room number and teacher's name must be written on the <u>BACK</u> of the display. Nothing on the front may identify the student, including photos.**

- Projects must follow the scientific method. The project should include the following:
  - Title
  - Question
  - Introduction
  - Hypothesis
  - Materials
  - Procedures
  - Results
  - Conclusions

  Please use this list to make sure that your project is complete. The **<u>Science Fair Project Worksheet</u>** guides students as they do their projects and covers what is required on your display board (available at www.maderapta.com or as a hard copy in the school office).

- Science projects are typically mounted on a display board made of heavy cardboard or poster board. **They must be <u>freestanding</u> and must not exceed the following dimensions: 36 inches high, 48 inches wide, and 15 inches deep (standard size display board).** Display boards are usually available atStaples, Target, and Joann's. Projects mounted on a poster board must come with a display stand.
- **<u>If you are using photographs, they should not reveal the identity of the student or student's family.</u>**
- Props are discouraged, and should be replaced by photographs when possible.
- Dangerous chemicals, open flames and explosives may not be exhibited. All projects must be durable and safe. Moveable parts must be firmly attached.
- The main work on the project must clearly be understood and done by the student.
- Permission to use live animals (including humans) in a project must be obtained from your child's teacher. Project idea must be presented to obtain permission.

Science Fair Project Worksheet

Use this worksheet as a guide in writing up your project. **Do not turn this worksheet in**. Directions and suggestions are given in each section. Fill in the blanks in all the boxed sections. Copy your answers to the final draft of your science fair project.

- **Title** – Choose a brief title for your project. Titles are often "catchy", but do not have to be. (You may want to wait until you have completed your experiment before giving it a title.)

The title of my project is _____.

- **Question** –What question are you trying to answer by doing your project? A statement and not just a "yes" or a "no" should answer your question. Your question should be fairly specific. A good way to form a question is: "How does _____ affect _____?"

  Examples:
  - How does *the color of light plants receive*affect *plant growth*?
  - How does *the amount of baking soda in cupcakes* affect *cupcake height*?

  Remember, you need an independent variable (the thing you will change) and at least one dependent variable (the thing you will observe or measure). In the two examples above, the independent variables are color of light and amount of baking soda, and the dependent variables are plant growth and cupcake height.

My Question is _____

_____.

- **Introduction** – This section talks about why you chose this experiment, who helped you, and what special research you did to learn more about this experiment. This section should be 3 or more sentences.

I chose this experiment because_____

_____

I got help from _____

I learned more about_____

_____

- **Hypothesis** – This is a guess of **what** you think will happen and **why** it will happen based on your research and thinking about your experiment. A good way to write a hypothesis is:
  "I think that _____ because _____.
  Examples:
  - I think that *plants that receive white light will grow taller and fuller than plants that just get red or blue light* because *I read that plants need lots of sunlight for growth*.
  - I think that *putting more baking soda in cupcakes will make cupcakes taller* because *baking soda produces gas that makes the cupcakes rise*.

My Hypothesis: I think that _____

_____

because _____

_____

- **Materials** – List all the materials you will use to perform the experiment. This is similar to the ingredient list of a recipe. More detail is better! Another person should be able to do your experiment based on your list of materials.

These are the items I need to perform my experiment:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

- **Procedure** – Write a step-by-step guide for doing the experiment. This is similar to the instructions part of a recipe. The more detail the better. Another person should be able to do your experiment based on the instructions in your procedure. **You should repeat your experiment 2 or more times to see if you get the same results**.

The steps to doing my experiment are:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

Feel free to add more steps if you need to.

On your display board, you may include photographs or drawings of the items in your experiment.

- **Results** – Record the results of your experiment. **Make a chart or a graph to make it easier for a person to see what you observed during your experiment**. You may also attach sample data sheets where you recorded your data. Write a paragraph that talks about the results in your charts and/or graphs. Remember to do your experiment more than once. On your display board, you may include photographs or drawings of the results of your experiment. Remember, photographs should not show faces that would identify students or family members. It may be helpful to show "before" and "after" pictures in some cases.

Chart of Results from Trial 1		

Chart of Results from Trial 2		

Chart of Results from Trial 3		

Feel free to do more trials.

Are your results consistent? If yes, what is the trend?

Example:

- *The plants under the white light grew taller than the plants under the red or blue light*
- *The more baking soda I used, the taller the cupcake.*

If there is no trend, say that your results do not show any trend.

Example:

- *My results were inconclusive because two of the three plants with the white light grew taller than the plants with the red and blue light. But one of the plants with the red light was taller than all the plants with the white light. Also, a couple of the plants with the blue light were taller than the red light plants, but shorter than the white light plants.*
- *The heights of the cupcakes did not vary consistently with the amount of the baking soda used.*

My results show

- **Conclusion** – What did you learn from the experiment? Tell whether your results show that your hypothesis was right or wrong. How do your results show that your hypothesis was right or wrong? If your hypothesis was wrong, why do you think you guessed wrong? Did anything go wrong when you did your experiment? What do you think you can change to make the experiment better? Who might benefit from what you have learned in your experiment?

  Remember to include a bibliography to acknowledge any sources you may have used in researching your project

My results showthat my hypothesis was_____

because_____

_____

_____

_____

_____

To make this experiment better, I can _____

_____

_____

_____

The people who may benefit from what I have learned in this experiment are

_____

because_____

_____

What Will Judges Be Looking For?

Below is a sample judging form to give you an idea of questions the judges will ask themselves as they look at projects.

For Experiments or Problem Solving Projects

Instructions

Assign points to each of the categories according to the following standard:
10 = outstanding, 8 = very good, 6 = average, 4 = poor, 2 = inadequate
The bullets under each category are guides for assigning points, but be flexible.
Do not try to determine the best project. It is possible for projects to be equally good.
Do not be concerned about being overly generous. Award points as merited or deduct points only when something is missing or wrong.

Scientific Method

_____ /10 Problem is clearly stated as a question
Offered a reasonable hypothesis, and if appropriate, explained the reason for the hypothesis

_____ /10 Procedure for the experiment is understandable to you and to a child

_____ /10 Graphs and charts are labeled properly.
- ❖ If there is no possible way to use graphs or charts, award a 10. If there is no way to quantify results, but they have a graphic display of results, award a 10.

_____ /10 Conclusion is supported by the results.
Hypothesis is compared to the conclusion.
Attempted to establish a relationship between cause and effect

_____ /10 The experiment was controlled.
- ❖ Some experiments may be harder to control than others. Do not downgrade points if there was a reasonable attempt to control the experiment.

Enough trials were made to verify results.
- ❖ Comparisons were made to prove that the result was not accidental
- ❖ If result was not what was expected, were comparisons made to what would have happened under any condition other than the experiment.

Scientific Accuracy

_____ /10 Factual information explained correctly and numbers calculated accurately
Spelling and grammar are correct.
Bibliography of sources included

Knowledge

_____ /10 Student **could and does understand** the concept and has learned from the experiment. Project shows logical development.

Presentation of Project

_____ /10 Title, report, and labels are neat and legible as appropriate to child's age.
Presentation is attractive as appropriate to child's age level.

- Do not downgrade if it is acceptable. Only downgrade for unacceptable attempts.

Project is displayed clearly, and if possible, includes "props".

Effort, Level of Difficulty and Overall Impression

_____ /10 Child has spent apparent time and effort on the project.

_____ /10 Award points based on your overall impression of the project.

_____ /100 **Total score**

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____