

Science Fair Information Packet

2011-2012

Students are to write a report in addition to providing a display board for their projects. Both report AND display board are due **February 10th**. Oral reports will also begin on that day.

The report will be typed in Times New Roman, 12 font, and double-spaced. Each paragraph should have **NO LESS** than five sentences in it, although you should have more. Feel free to go above and beyond by creating more than one paragraph for each step. The report should include a cover or title sheet, all of the steps in the following pages, and a reference page.

This packet includes:

- Cover/Title page
- How to write your science fair project report
- A schedule so that you stay on track over the break
- How to create your display board

Example of the cover page

Can a Potato Conduct Electricity?

(double space)

By Maria Montessori

(double space)

CMP-Elk Grove

(double space)

February 20, 2008

(Pictures of experiment on cover optional)

Scientific Method

A science project is an investigation using the scientific method to discover the answer to a scientific problem. The scientific method is the "tool" that scientists use to find the answers to questions. It is the process of thinking through the possible solutions to a problem and testing each possibility to find the best solution. The scientific method involves the following steps: doing research, identifying the problem, stating a hypothesis, conducting project experimentation, and reaching a conclusion.

1. Your first paragraph, the introduction to your report, will include: your question or **problem**, why you chose this topic (why are you interested in it), and identify exactly what your experiment will test.

Problem

The problem is the scientific question to be solved. It is best expressed as an "open-ended" question, which is a question that is answered with a statement, not just a yes or a no. For example, "How does light affect the reproduction of bread mold on white bread?"

- **Do** limit your problem. Note that the previous question is about one life process of molds—reproduction; one type of mold—bread mold; one type of bread—white bread; and one factor that affects its growth—light. To find the answer to a question such as "How does light affect molds?" would require that you test different life processes and an extensive variety of molds.
- **Do** choose a problem that can be solved experimentally. For example, the question "What is a mold?" can be answered by finding the definition of the word *mold* in the dictionary, but, "At room temperature, what is the growth rate of bread mold on white bread?" is a question that can be answered by experimentation.

2. Second paragraph; Hypothesis: What is your hypothesis? What are your predictions? Why do you think this? This is the only section where you can state an opinion.

Hypothesis

A hypothesis is an idea about the solution to a problem, based on knowledge and research. While the hypothesis is a single statement, it is the key to a successful project. All of your project research is done with the goal of expressing a problem, proposing an answer to it (the hypothesis), and designing project experimentation. Then all of your project experimenting will be performed to test the hypothesis. The hypothesis should make a claim about how two factors relate. For example, in the following sample hypothesis, the two relating factors are light and bread mold growth. Here is one example of a hypothesis for the earlier problem question:

"I believe that bread mold does not need light for reproduction on white bread. I base my hypothesis on these facts:

organisms with chlorophyll need light to survive. Molds do not have chlorophyll.

In my exploratory experiment, bread mold grew on white bread kept in a dark bread box."

- **Do** state facts from past experiences or observations on which you base your hypothesis.
- **Do** write down your hypothesis before beginning the project experimentation.
- **Don't** change your hypothesis even if experimentation does not support it. If time permits, repeat or redesign the experiment to confirm your results.

3. Third paragraph, Research: How are you going to get your information (internet, reference books, educational videos)? Include research you found to support your topic or to tell your audience more about the topic. Remember, you are the expert on this topic; most of the audience will need to know more about your topic to understand your experiment.

Research

Research is the process of collecting information from your own experiences, knowledgeable sources, and data from exploratory experiments. Your first research is used to select a project topic. This is called topic research. For example, you observe a black growth on bread slices and wonder how it got there. Because of this experience, you decide to learn more about mold growth. Your topic will be about fungal reproduction. (*Fungal* refers to plant-like organisms called fungi, which cannot make their own food, and *reproduction* is the making of a new offspring.) CAUTION: If you are allergic to mold, this is not a topic you would investigate. Choose a topic that is safe for you to do.

After you have selected a topic, you begin what is called project research. This is research to help you understand the topic, express a problem, propose a hypothesis, and design one or more project experiments—experiments designed to test the hypothesis. An example of project research would be to place a fresh loaf of white bread in a bread box and observe the bread over a period of time as an exploratory experiment. The result of this experiment and other research give you the needed information for the next step—identifying the problem.

- **Do** use many references from printed sources—books, journals, magazines, and newspapers—as well as electronic sources—computer software and online services.
- **Do** gather information from professionals—instructors, librarians, and scientists, such as physicians and veterinarians.
- **Do** perform other exploratory experiment related to your topic.

4. Fourth paragraph, Project Experimentation: Tell us about your experiment. Create a list of materials you are using, be as specific as possible, include measurements if they are necessary in achieving a specific outcome.

Example: In order to conduct my experiment, I needed the following materials:

- 1 zipper sandwich bag
- 1 graham cracker (all 4 squares)

1 half of a banana
2 tablespoons of water (no specific temperature)

This experiment was conducted over a three-week period. (Now tell me how you are conducting your experiment) The first step in my experiment is.....
Next, I...Be sure that your steps are detailed enough that the experiment can be conducted again, by you or someone else, and the same results can be achieved. Include all measurements (I poured in 1 tablespoon of water every 2 hours for 3 days) and intervals. The exact sequence of the steps is important! Please include pre-experiment steps such as 1. Buy zipper sandwich bags...5.Cut banana....
You may have many, many steps. You may want to take pictures during your experiment to add to your display board.

Project experimentation is the process of testing a hypothesis. The things that have an effect on the experiment are called variables. There are three kinds of variables that you need to identify in your experiments: independent, dependent, and controlled. The **independent variable** is the variable you purposely manipulate (change). The **dependent variable** is the variable that is being observed, which changes in response to the independent variable. The variables that are not changed are called **controlled variables**.

The problem in this section concerns the effect of light on the reproduction of bread mold. The independent variable for the experiment is light and the dependent variable is bread mold reproduction. A control is a test in which the independent variable is kept constant in order to measure changes in the dependent variable. In a control, all variables are identical to the experimental setup—your original setup—except for the independent variable. Factors that are identical in both the experimental setup and the control setup are the controlled variables. For example, prepare the experiment by placing three or four loaves of white bread in cardboard boxes the size of a bread box, one loaf per box. Close the boxes so that they receive no light. If, at the end of a set time period, the mold grows, you might decide that no light was needed for mold reproduction. But, before making this decision, you must determine experimentally if the mold would grow with light. Thus, control groups must be set up of bread that receives light throughout the testing period. Do this by placing an equal number of loaves in comparable-size boxes, but leave them open.

The other variables for the experimental and control setup, such as the environmental conditions for the room where the boxes are placed—temperature and humidity—and the brand of the breads used must be kept the same. These are controlled variables. Note that when designing the procedure of your project experiment, you must include steps for measuring the results. For example, to measure the amount of mold growth, you might draw 1/2-inch (1-cm) squares on a transparent sheet of plastic. This could be placed over the bread, and the number of squares with mold growth could be counted. Also, as it is best to perform the experiment more than once, it is also good to have more than one control. You might have one control for every experimental setup.

- **Do** have only one independent variable during an experiment.
- **Do** repeat the experiment more than once to verify your results.
- **Do** have a control.
- **Do** have more than one control, with each being identical.
- **Do** organize data.

5. Fifth paragraph: Organize and analyze your results. This is where you will reveal your results. What happened during your experiment? You may also want to create a visual aid for your display board to demonstrate your results (graphs, tables, logs, pictures).

6. Sixth paragraph; Project Conclusion: Begin this paragraph by restating your question and hypothesis. Then answer these questions: What do your results mean? What can you conclude from this? Was your hypothesis accurate? Did you discover any patterns during your experiment?

The project conclusion is a summary of the results of the project experimentation and a statement of how the results relate to the hypothesis. Reasons for experimental results that are contrary to the hypothesis are included. If applicable, the conclusion can end by giving ideas for further testing.

If your results do not support your hypothesis:

- **DON'T** change your hypothesis.
- **DON'T** leave out experimental results that do not support your hypothesis.
- **DO** give possible reasons for the difference between your hypothesis and the experimental results.
- **DO** give ways that you can experiment further to find a solution.

If your results support your hypothesis:

You might say, for example, "As stated in my hypothesis, I believe that light is not necessary during the germination of bean seeds. My experimentation supports the idea that bean seeds will germinate without light. After seven days, the seeds tested were seen growing in full light and in no light. It is possible that some light reached the 'no light' containers that were placed in a dark closet. If I were to improve on this experiment, I would place the 'no light' containers in a light-proof box and/or wrap them in light-proof material, such as aluminum foil."

References

This will be on its own page. The word “references” should be centered at the top of the page.)

To reference books:

Authors last name, first name. (date published).*Title*. City, State it was published:

Publisher.

Coker, Lisa. (2000). *The Human Body*. Elk Grove, Ca.: McGraw Hill.

Web sites:

Author. Title of page. Web address and date

Smith, Sara. *Wacky Science Experiments*. Retrieved from the world wide web at

<http://www.sarascience.net> on February 12, 2007.

(Notice that if your reference takes up 2 lines you must indent the second line as shown on the examples. References also need to be double-spaced.)

**The following website is useful if you need help citing your references.
Choose the APA format.**

<http://citationmachine.net>

Your Display Board

You will need a tri fold project display board. These can be found at any office supply store, teacher supply store, and sometimes Walmart.

Please put your name ON THE BACK of the board. Enlarge the font size of your headings on your display board to 28 or 36. The headings of your display board should include the steps below with the necessary information displayed below the title.

- Problem or question
- Research
- Hypothesis
- Project Experimentation (include pictures, graphs, etc.)
 - List of materials needed
 - Bullet point the steps in your experiment
- Results
- Conclusion

If you keep a journal of your progress you will need to include it with your project set up.



Use the timetable below to help you manage your time. This schedule is for your personal use. You do not need to turn anything in until the final due date.

Four-Week Science Fair Schedule		
Date Report and Board are Due		2/10/12
Date of Science Fair		2/11/12
Scheduled Weekly Events	Scheduled Completion Date	Actual Completion Date
Week 1 <ul style="list-style-type: none"> • Start a journal to keep all your notes and research as you go. • Record problem in journal or type in Word Document (remember to save all typed info). • Begin your research. Record information you have found from books, magazines, experts, or internet. • Decide on your hypothesis and record it in your journal or type in Word Document (remember to save all typed info). 	1/6/12	
Week 2 <ul style="list-style-type: none"> • Continue research. • Decide how to set up experiment. • Begin conducting experiment. • Record or type all steps and materials needed in Word Document (remember to save all typed info). 	1/13/12	
Week 3 <ul style="list-style-type: none"> • Review experiment you conducted. • Analyze your results. • Record or type analysis in Word Document (remember to save all typed info). • Draw final conclusions of experiment. • Record or type conclusions in Word Document (remember to save all typed info). • 	1/20/12	
Week 4 <ul style="list-style-type: none"> • Type report if you have been recording process in a journal. • Ask an adult to proof read your report. • Make any revisions on your final draft. • Create display board • Gather materials you will need to bring to school. 	1/27/12	