Mitchell Middle School

Science Project

Adapted from Grant Park High School

Exhibition and Competition Handbook

2008-2009

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Introduction

Working on a Science Project is an educational experience that should help you "learn how to learn". It is a chance to think critically and to investigate a topic that interests you.

Like most things you do, either in or out of school, the more effort you put into your work, the more benefit you will get from it. When you have put a lot of effort into completing the Science Project, you will have the satisfaction of knowing that you did your best and you will receive a good mark.

WHAT IS A SCIENCE FAIR PROJECT?

Simply stated, a Science Project involves trying to solve a problem by using some of the methods of Science such as observation and experimentation.

Like any other assignment that you do in school, your project has to follow the teacher's instructions to do well. In other words, to be successful, your project must fully satisfy the marking scheme.
There are two types of projects: those that are experimental and those that are not. When you examine the marking scheme on the following pages, you will find that experimental projects will tend to do better. They are favored by the marking system.

The type of project we encourage students to work on is called the **controlled experiment.** This is where one tests the effect of one variable on another. Examples of controlled experiments are:

(1) What is the effect of exercise on heart rate?
(2) How does temperature affect the activity of insects?
(3) How does rate affect the rate of swing of a pendulum?

In a controlled experiment, the experimenter changes one variable (called the independent variable) to try to find out what will happen to another variable (called the dependent variable). All other possible variables (called control variables) are held constant so that they do not interfere with the test.

Another type of Science project involves mainly **observation** and tries to answer questions such as:

(1) What are the eating habits of hummingbirds?
(2) How do the phases of the moon change?
(3) What activities do ants perform?

Choosing a Project

- Is the subject of the project interesting to me?
- Are the necessary materials and equipment available?
- If some materials must be purchased, can I afford them?
- Has my Science teacher approved the project?
- Have I made a preliminary investigation?
- Do I have the ability to proceed successfully with the project?
- Is the scope of the project narrow enough for me to complete the project on time?
- Are the Science activities in the project safe for both others and me?
- Will I be using the methods of Science to try to solve the problem?
- Does my project fall within the marking scheme and general regulations?

All ten of these questions must be answered positively before going ahead with a project. If even one questions is answered 'no' then don't proceed with the project. The best way to choose a project topic is by asking yourself interesting questions. Try to think of things that have puzzled you or things that you have wondered about such as:

- Do shower baths use more water than tub baths?
- Do girls have a faster reaction time than boys?
- Does water sink into all types of soil at the same rate?

The Background Report

The background report deals mainly with a review of the related literature and research on your topic. This is a fancy way of saying: Find out and report on what other people have written or discovered about your topic. The background report could also contain descriptions of subject matter directly related to your topic. Even definitions of important terms could be included here.

Visit school and public libraries. Going to a specialized library such as the science library at a university may produce a bonanza of information. Just remember that it should be original work and not a printed document photocopied from a book or downloaded from the Internet.

Time Line and Marking Scheme

The project must be done in stages. These stages are shorter assignments of work that must be completed by certain dates. Your teacher will evaluate you work at each stage.

Possible		*Actual*
Stage One (due Nov 7)		
Statement of the problem you will try to solve	5	____
Statement of the hypothesis to be tested	5	____
Project notebook (Log section)	5	____
Stage Two (due Dec 12)		
Background report	20	____
Plan of the experiment	20	____
Project notebook	5	____
Stage Three (due Feb 27)		
Experimental results and conclusion	20	____
Project notebook (log section)	5	____
Project notebook (Organization and completeness)	15	____
Stage Four (due March 27)		
Display/ Exhibit	25	____

Total Possible Marks = 125 ____

Bonus of 10 for finishing stage four by March 22, 2007

The Project Notebook

When competent scientists plan and perform experiments they keep accurate records in notebooks. They record ideas for experiments, dates and times when experiments are performed, and plans for future experiments. All observations are made and data collected are accurately and honestly recorded.

Section One:

This is the "Log Section" which is similar to a daily journal. Record what you did as well as the dates.

Example:

Sept. 15 - read through the science project booklet

-the teacher explained the project to the class

Sept.18 - visited the library to get ideas for a topic
- browsed through a few books on Science activities
- talked to the librarian about the project

Oct. 8 - visited the Public Library
- found a good book in the growth of plants

Oct. 12 - Hurray! I have a topic: How does magnetism affect the Growth of plants?

Section Two:

This section contains the following:

1. The problem and the hypothesis
2. The background essay
3. The plan of the experiment
4. The data and results
5. The conclusion and the application

The project notebook must contain

1. Title page
2. Table of contents
3. Bibliography

Statement of the Problem

Express the purpose of your investigation in the form of a question or a brief statement. Try to be as specific as possible.

Example: Instead of calling your project "Seed Growth" state exactly what you are investigating about seed growth.

1. How do microwaves affect seed growth?
2. A Study of the Effect of Microwaves on Seed Growth.

The Hypothesis

The Hypothesis is a statement about the facts that will be investigated. When you hypothesize, you are predicting what you expect to happen during your investigation. The reason for having the hypothesis is that is gets you started with your experiment. The experiment is designed or planned to 'test' the hypothesis. That is, to determine whether the hypothesis is correct or incorrect. If the results of your experiment support the hypothesis, you can state in your conclusion that the hypothesis is accepted. If the results do not support the hypothesis, you can conclude that the hypothesis is rejected.

Example Problem: How does amount of air affect how a basketball bounces?

The Hypothesis: If air is added to a basketball, it will bounce higher.

The Plan of the Experiment

The plan of the experiment is the procedure that you intend to use in trying to prove or disprove your hypothesis. The plan should contain five main parts:

1. Statement of the problem
2. The steps you are going to follow to perform the experiment
3. A list of materials
4. A way of recording observations
5. A time schedule

A well-planned procedure will do the following:

- State the hypothesis to be tested
- Identify the independent variable
- Describe how the independent variable will be changed
- Identify the dependent variable
- Describe the method for measuring any changes in the dependent variable
- Identify other possible independent variables that may affect the dependent variable (these are the control variables)
- Describe the way that the variables in the previous point will be controlled (they are usually held constant or unchanging)

Data and Results

After you are satisfied that you have a well-planned procedure, start your experiment. Keep accurate and detailed records of when you try the experiment, what you do and what you observe happening. Make a record of any observations as soon as they occur. This also applies to the collection of data such as measurements. Always record data and observations as soon as they are obtained. Never rely on your memory. Try to repeat your experiment several times so as to improve the accuracy of your results.

An effective way of organizing raw data such as measurements is to place them into tables. Each column of a table should have an appropriate heading and the correct unit of measurement should be stated.

After the raw data have been collected, you might want to summarize them. Graphs, such as line charts and bar charts may reveal patterns and trends in your data. You might want to enter your raw data into a spreadsheet program and have a computer construct the charts for you.

Examine the data carefully. Write statements about what the data are saying. These statements are your results.

Conclusion

The conclusion is the last part of your investigation. Here you want to deal with what you have learned by performing the experiment. Base your conclusion on the data that you have collected.

Look over the data. You may notice patterns or trends. There may be a direct relationship between the independent and dependent variables. For example: *As the number of turns of wires increases, the electromagnet gets stronger.* There may be an inverse relationship between the independent and dependent variables. For example: *As an elastic band gets longer, it's width deceases.* There may be no relationship between the independent and dependent variables. For example: *As the mass of a pendulum increases, its rate of swing remains unchanged.*

You performed the experiment to 'test' the hypothesis. Study and examine the data. Does the data support the hypothesis? If the answer is yes, then state that the hypothesis is 'accepted'. If the answer is no, then state that the hypothesis is 'rejected'.

It is very important to understand that rejecting the hypothesis does not mean that the experiment is a failure. On the contrary, you have made a worthwhile discovery. However, now you might want to state a different hypothesis and then perform another experiment.

In conclusion, you want to make a decision. Did I accomplish what I set out to do? Remember you carried out the project to try to find a solution to a problem. Base your solution on the data you collected and perhaps also on what you found out in your background report.

Applications

After you have described the results of the experiment and the conclusion that follows from these results, you should now consider some practical ways to apply this knowledge.

Here is an example of a Judges' Score Sheet.

Judges' Score Sheet

Student's Name _____

Category (CE, SS, I) _____

Title of Project _____

1.	**Knowledge Gained**	**1 2 3 4 5 6 7 8 9 10**
	(Has student acquired knowledge by doing this project?)	
2.	**Information**	**1 2 3 4 5 6 7 8 9 10**
	(Information collected through research valid and appropriate to grade level?)	
3.	**Scientific Approach – Mark each type of project separately.**	
	a. *Controlled Experiment*	**1 2 3 4 5 6 7 8 9 10**
	(Was scientific process and control variable used in experiment?)	
	b. *Scientific Study*	**1 2 3 4 5**
	(Was the research and data collection thorough and exhaustive?)	
4.	**Collection of Data**	**1 2 3 4 5 6 7 8 9 10**
	(Were measurements accurate, sources of info varied, and the data organized and logically presented?)	
5.	**Conclusions**	**1 2 3 4 5 6 7 8 9 10**
	(Were stated and conclusion logical and valid?)	
6.	**Written Work**	**1 2 3 4 5 6 7 8 9 10**
	(Logbook present and was organized/complete?)	
7.	**Oral Presentation**	**1 2 3 4 5 6 7 8 9 10**
	(Was it well planned and interesting?)	
8.	**Exhibit**	**1 2 3 4 5 6 7 8 9 10**
	(Visually appealing, neat, and attractive?)	
9.	**Effort**	**1 2 3 4 5 6 7 8 9 10**
	(Degree of individual effort demonstrated?)	
10.	**Creativity and Originality**	**1 2 3 4 5 6 7 8 9 10**
	(Does project show creative approach or thought in design or presentation?)	

Comments: _____

_____

Category Awards

Gold	90-100
Blue	80-89
Yellow	65-79
White	1-65

Total Score _____

Average/Final Score Calculation