A Manual For Writing An Elementary Science & Engineering Fair Paper

(Grades 4 - 6)

This paper includes all of the topics that need to be covered in a science and engineering fair paper. The style of the sample paper is just an example. You may use the preferred style of you school if one exists.

A Writing Guide for Elementary Science Fair Projects

The abundance of word processing software available has made writing reports and papers a much easier process for many students. This guide offers several suggestions for the technical aspects of producing an elementary science research paper.

- **Suggested Fonts**: Choose a font that is clear and easy to read – Times New Roman, Arial, or Courier are easy to read. This guide is typed in the Arial font. It is best not to use script or bold styles unless a word or phrase is being emphasized.

- **Size of Font:** Most software allows you to choose the size of type used in a document. For the normal body of a report, the most common size type is 12. In titles or headings, the size of type can be increased to add emphasis. When the size of type is increased, it is common to use the **Bold** style. Those sizes, styles and alignments are noted in the body of this manual as they are used.

- **Spacing and Form Pages:** This booklet contains ***suggestion, not requirementss*** for the form that may be used in producing an elementary science paper. The size and style of font used is noted throughout this manual.

- **Margins:** A 1" inch margin on each side of the paper is suggested.

- **Language:** Proper usage of the English language and correct spelling must be observed at all times. You may receive additional help from your science or English teacher in regard to the proper rules of writing.

  Third person, past tense should be observed in writing the science paper. You should, whenever possible, avoid direct reference to yourself.

  Incorrect: "I then devised a new method ..." (First person, past tense.)
  Correct: "A new method was then devised ..." (Third person, past tense.)

  If you find it necessary to refer to yourself directly, you may do so as: "The writer then devised a new method."

- **Format:** Each separate topic should appear on a separate page and only one side of each sheet of paper is used.

Separate topics are as follows:

Title Page
The title should be brief, but accurate and comprehensive. Effective titles are often composed of three or four main words or groups of words.

Abstract
An abstract is to be submitted as part of your paper. It is perhaps the most important section of the paper and the most difficult to write. Although the abstract is usually read first, *it should be written last* to ensure that it accurately reflects the content of the paper. An abstract should be informative, summarizing the principal facts and conclusions of the paper.

The abstract should indicate the subject dealt within your paper and should state the objectives. The methods you used in obtaining the results should be included. The findings should be summarized, remembering that it is better to say, for example, "The heart rate was found to be 82 beats/minute," than "The heart rate was measured." Finally, keep the abstract to one paragraph and no longer than 250 words.

Table of Contents

The main headings of the Table of Contents are written in full capitals, with no terminal punctuation, and are consecutively numbered in capital Roman numerals. If a heading requires more than one line, the second and following lines are indented five spaces in from the first letter of the first line and are double-spaced.

Review of the Literature

You should present a brief review of the history and present status of the subject, citing truly pertinent information. Terms used here, or later in the paper, should be identified.

Statement of the Problem

The statement of the problem begins by relating the information gathered from observations and/or from the literature read that led you to your problem. The problem under investigation or experimentation is stated clearly and completely. This statement should be concise, brief, and very carefully composed. Often it is helpful to state it as a question.

Hypothesis(es)

You should use information gained from the review of the literature as a basis for stating a possible solution to the problem. This "tentative" answer to the problem is your hypothesis. Although hypotheses may be written in a variety of ways, it is recommended that you use the "**If-then**" format. This means that you express your hypothesis as an "If-then" statement. The "**If**" part of the statement describes the environmental conditions under which your experiment was set up and identifies the independent (experimental) variable you manipulated in your experiment. The "**then**" part describes what you predicted would happen at the end of your experiment and identifies your dependent variable (i.e., the variable that you ended up measuring).

Example: "**If** the temperature of the water surrounding fish is increased, **then** the fish will breathe faster."

Procedure

Here, you very carefully record step by step the manner in which the experiment was performed. The key to writing this section is that upon completion, there will be enough detail to allow the experiment to be repeated by others. You should give special care to include critical details (controlled variables) which influence the reliability of the results along with identification of controls, safety measure, etc., where appropriate. A detailed description of materials and equipment used should be included.

You should describe how your data was collected. Include such things as: how often measurements or readings were made, the units of measurement used, the instruments used to make the measurements, etc. Remember, too, all measurements are to be made in metric units.

Results

In this section you objectively review the data collected. Graphs, tables, and figures may be used to aid in displaying the data to the reader. If included, however, they should be discussed in the written portion of this section.

Conclusion

This is one of the most important sections of your paper. Here you should explain the meaning or significance of your experimental results. Answers to such questions as the following should be presented. What do the data show and what do they mean? Did the data allow you, the researcher, to support or accept the hypothesis or do the data call for the hypothesis to be refuted or rejected? What is the relationship between

the variable that was changed in the experiment and the variable that was observed or measured (i.e., what was the effect of the independent variable) or the dependent variable? An important thing to remember is that any interpretation or conclusion you make *must be supported by the data you gathered in this investigation.*

Future

If appropriate at this point, you should include ideas for future investigation of this problem or for new problems posed as a result of this investigation. Remember, science is a continuing process that never comes to an end.

Acknowledgments

Contributions of persons, other than co-authors, who have helped you substantially with your investigation should be acknowledged in a separate section in your paper. Recognition of assistance should be stated as briefly as possible. It is customary to acknowledge any financial support that you received for your investigation as well as borrowed materials and equipment.

Bibliography

In your bibliographic list, the entries are listed alphabetically by author. The main parts of a complete entry for a book are (i) name(s) of author(s), (ii) year of publication, (iii) title of book, (iv) name and city of publisher, (v) number of pages in book (not necessarily in this order).

Example: Smith, John, and Sue Brown. 1972. *Invertebrate zoology.* McGraw-Hill, St. Louis. 400 pp.

When citing Internet resources you need to include the date you viewed it, as some pages can change over time. For more details on citing web pages go to, www.sciencebuddies.org/science-fair-projects/project_biblio.shtml for latest instructions.

A Study Of Two Ramps

(Size 16 Font, Bold Style, Centered, First letter of each word in Capital Letters)

(Return 10 times, single space)

A Science Paper

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Presented to

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The Greater Kansas City Science & Engineering Fair

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April 1, 20XX

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Acknowledgment

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I greatly appreciate the help supplied by my teacher during this study. I also wish to thank my P.E. teacher, Ms. Jones, for the use of her stopwatch.

TABLE OF CONTENTS

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Note: Set the tabs to align the different sections of the paper. The page numbers should be filled in after the paper is complete to ensure that they are accurate.

Abstract

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Sometimes people need to increase the speed of an object rolling down a ramp. It is hypothesized that by raising the height of the ramp, an object can be made to move faster down the ramp. Two ramps of the same length (60 cm) were built. One ramp, however, was 30 cm high and the other was only 20 cm high. A marble was rolled down each ramp ten times and the speed measured with a stopwatch. This procedure was done for three trials. The data showed that the marble rolled down the higher ramp was faster (an average of 6.3 seconds for all three trials) than down the lower ramp (an average of 7.2 seconds for all three trials). The data tend to support the hypothesis.

Statement Of Problem

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People sometimes have the problem of needing to roll an object down a ramp in the shortest period of time. Is it possible to move that object in a shorter period of time by changing the height of the ramp?

Review Of The Literature

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All around us thousands of objects are pushing and pulling on each other. This pushing and pulling is called "force." Force acts in many ways on all sorts of things.

By pushing on an object the motion and direction of that object can be changed. It can speed up when more force is used, or slowed down if the force is stopped. Objects like bowling balls and bicycle wheels will then eventually slow down.

The weight of an object causes it to fall. This is called the "force of gravity." The force can be measured by the change of speed it produces on an object of a certain weight in a certain time. One way force is created is by people and animals pushing or pulling. Another way to create force is to use something to help, such as a ramp or stairs.

One way to increase the falling speed of an object is to use a ramp or inclined plane. If the ramp is made higher, it takes less force to move an object down the ramp. But to move an object up the ramp it takes more force. That means the greater the distance of the ramp, the more force is needed to raise the object to the height of the ramp.

Finally, gravity increases the force when the object is moving down the ramp.

Hypothesis

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If the height of a ramp is raised, then an object will move faster down the ramp.

Procedure

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Two ramps were made. Ramp A was made 30 centimeters tall and 60 centimeters long. Ramp B was made 20 centimeters tall and 60 centimeters long. Both ramps had a straight flat shape. A marble was rolled down Ramp A 10 times. The time needed for the marble to reach the end of Ramp A was timed with a stopwatch each time. A record was kept of these times and is shown in the line marked "A" in Table 1. The same procedure was followed for Ramp B. The data obtained for Ramp B is shown in the line marked "B" in Table 1.

These two procedures were repeated two more times. See Table 1.

Results

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The only variables intended to be in the study were the independent variable of ramp height and the dependent variable of time required to roll down the ramp. The ramps were made from the same sheet of cardboard. Both were made 60 cm long. The same marble and stopwatch were used for each trail. The average time required for the marble to roll down ramp A was 6.3 seconds. The average time required for Ramp B was 7.2 seconds. (See Table 1)

Conclusion

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It was found that the height of the ramp made a difference in how fast the marble moved down the ramp. The data therefore tends to support the hypothesis.

Future Study

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The writer wonders if changing the surface shape of the ramp will affect the speed, and also what effect friction has. It would be interesting to study the difference height makes in pushing objects up the ramp and to learn about how the length of a ramp affects the speed of an object.

Table I

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Run Number	Trial 1		Trial 2		Trial 3	
	Ramp A	Ramp B	Ramp A	Ramp B	Ramp A	Ramp B
1	8.0	8.5	8.1	8.4	7.9	8.2
2	7.3	7.7	7.2	7.5	7.0	7.6
3	6.5	7.4	6.3	7.4	6.1	7.3
4	5.4	7.3	5.2	7.2	5.3	7.5
5	5.6	7.0	5.5	6.9	5.7	6.7
6	6.0	7.2	5.9	6.5	5.5	6.6
7	7.0	6.9	6.1	7.3	5.4	6.8
8	7.5	7.1	6.0	6.5	5.9	7.0
9	7.5	6.9	6.3	7.2	5.7	6.9
10	6.5	7.2	6.6	7.1	5.9	7.4
Total	673	732	632	720	604	720
Average	6.7	7.3	6.3	7.2	6.0	7.2

	Ramp A	Ramp B
Average for all three trials	6.3	7.2

Note: Hand written tables can be used if neatly done.

Figure 1
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Trial 1

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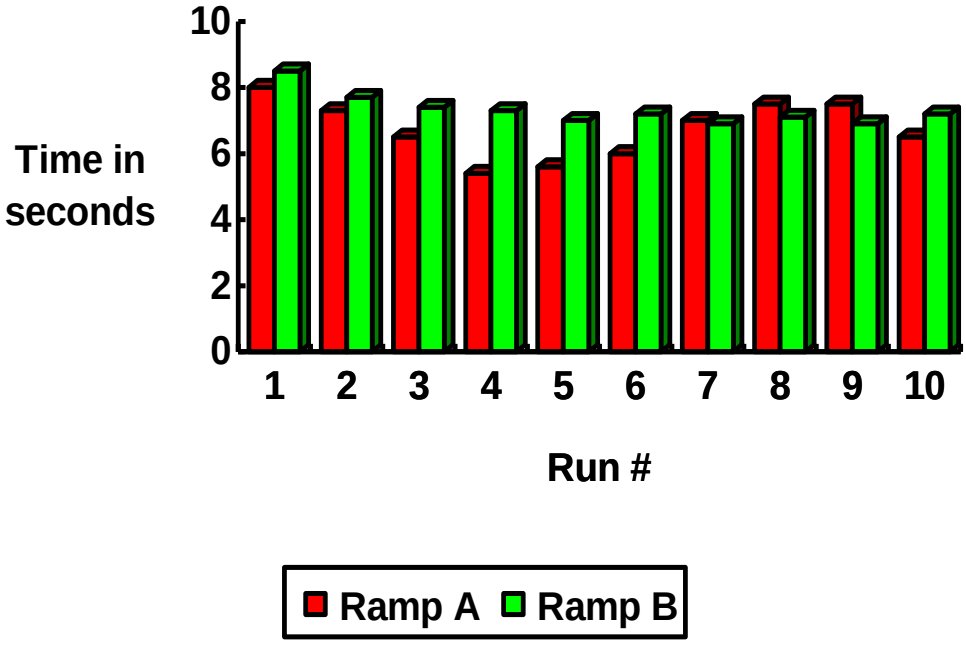

Bibliography

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Elementary Science. New York: Rinehart, and Winston, 1985.

Gravity: How it Affects Us. EBEC film.

Selsam, Millicent. *Up, Down, and Around: The Force of Gravity*. New York: Doubleday and Company, 1977.

Simon, Seymour. *Motion*. New York: Coward, 1968.

Ubell, Earl. *The World of Push and Pull*. New York: Atheneum, 1964.

Note: A bibliography includes books, films, people, magazines, Internet sites, and any other sources consulted. The listings are alphabetical according to the author's last name, or the name of the source if an author is not listed. The entries are in"reverse indentation," i.e., the second line of the entry is indented, rather than the first as would occur in a paragraph.