



PROJECT TYPES: THREE BASIC CHOICES

You have the opportunity to choose anyone or a mixture of the following three types of science projects:

1. An Investigation

In this type of project, you are expected to carry out an inquiry to find out the answer to a science question. A scientific approach is to be adopted.

Examples:

- What is the maximum speed that an athlete can attain in a 100 metres race?
- How fast does a plant make starch?
- How does the pH of a solution change with time?

2. Construction of a Kit or Model

In this type of project, you are expected to construct a kit or model that will illustrate a science concept.

Examples:

- A model of a solar home
- An ecology terrarium
- Minimizing heat loss in a model house.

3. Demonstration of a Scientific Principle

In this type of project, you are expected to use your creative thinking skills to confirm or affirm a scientific principle.

Examples:

- Measuring lung capacity
- An oil-drop model of a splitting atom
- An electrical smoke trap

1. An Investigation

Example: What is the maximum speed that an athlete can attain in a 100 metre race?

Purpose: What exactly are you trying to figure out with your project? Make a statement, for example: Does the athlete attain a maximum speed during the 100 m race?

Hypothesis: Based on what you know, try to make an answer for your question. Your hypothesis is your best guess.

As you do your project, you will try to find out if your hypothesis is true. A hypothesis is a statement, such as: the athlete runs at a constant speed. Note that the hypothesis may be a positive, negative or neutral statement.

Procedure:

Research: Collect information to help you answer your question. Use books, magazines, interviews, and TV. Try contacting experts, utilities, or government offices. You might contact officials from the Ministry of Sport.

Experiment: A hypothesis must be proved or disproved, so this is your chance to test it out. Note: This investigation may entail two independent methods: mechanical method or use of ICT.

- Nine students with stopwatches are to be posted at 10 m interval from each other,
- When the athlete passes each student, the time is recorded,
- Using a graphical method, the instantaneous speed is determined,
- The hypothesis is confirmed or rejected.

Use of ICT

1. A number of sensors (light gates) are set at regular interval along the path of the runner,
2. The sensors connected to a computer will trigger the timer,
3. Appropriate software can be used to analyze the data and the hypothesis can be confirmed or rejected.

Results: List the results from your experiment. Use a notebook, charts, or graphs to show the results or your heart rate tests.

Make sure your results are clear, and give facts, not opinions.

Conclusion: What did your project teach you? Do athletes attain a maximum speed and what is it? Even if your experiment proved that your hypothesis wasn't true, you've learned something.



2. Construction of a Kit or Model

Example: A model of a solar home

Purpose: First, think about how you could use your model to answer a question or show something. For example, your purpose might be to find out how solar energy can be stored within a home.

Hypothesis: The hypothesis is the idea you want to try out. When tested, it will help you accomplish your purpose. For example: A model of a solar home will show that certain materials will store solar energy for use in home heating.

Procedure:

Research: Gather information to help you build your model and learn about solar energy. Besides using books and the Internet, you might contact a solar engineer or an architect who specializes in solar homes.

Experiment: Test your hypothesis. How can you prove that solar energy can be stored as heat energy in a solar home? What are the appropriate materials to be used?

Results: Provide exact measurements and outcomes from your experiment.

Conclusion: What is the importance of your project? What might your project lead to?



3. Demonstration of a Scientific Principle

Example: Measuring lung capacity

Purpose: Focus on a specific thing you'd like to learn from your demonstration. For example, your purpose might be to find out if large lung capacity is an advantage during exercise.

Hypothesis: Explain what you think your project will demonstrate. For example: Students with the largest lung capacities can do the most exercise.

Procedure:

Research: Search for information about lungs, their purpose, how they work, and their importance to exercise. In addition to books and the Internet, you might contact your local pulmonary specialist or Ministry of Health.

Experiment: Test your hypothesis. Use students of similar size and strength, measure their lung capacity, and test their heart rates after the same amount of exercise. Results: List the main points of what you've learned. What did your research and experiments prove?

Conclusion: What does all your data add up to? Was your hypothesis correct? What is the value of your project?



THE SCIENTIFIC METHOD

The following is a review of the Scientific Method with some key questions and directions on how to design and conduct an experiment.

Problem/Purpose

- What is your goal?
- What idea are you trying to test?
- What is the scientific question you are trying to answer?

Hypothesis: Explain how you think your project can demonstrate your purpose. Make a prediction regarding the outcome of your experiment. State the results you are predicting in measurable terms.

Procedure

- Give a detailed explanation of how you will conduct the experiment to test your hypothesis.
- Be clear about the variables (elements of the experiment that change to test your hypothesis) versus your controls (elements of the experiment that do not change).
- Be very specific about how you will measure results to prove or disprove your hypothesis. You should include a regular timetable for measuring results or observing the projects (for example, every hour, every day, every week).
- Your procedure should be like a recipe - Another person should be able to perform your experiment following your procedure. Test this with a friend or parent to be sure you have not forgotten anything.

Materials:

- List all materials and equipment that were used.
- Your list of materials should include all of the ingredients of the procedure recipe.

Observations/Data/Results:

- Keep a detailed journal of observations, data, and results. Your journal should contain data measurements and written notes about what you are sensing (hearing, seeing, or touching) about your experiment.
- If appropriate, photograph your project results or phases of the project to help your analysis and possibly to demonstrate your experiment on your exhibit board.



Analysis

- Explain your observations, data, and results. This is a summary of what your data has shown you.
- List the main points that you have learned.
- Why did the results occur? What did your experiment prove?
- Was your hypothesis correct? Did your experiment prove or disprove your hypothesis? This should be explained thoroughly.

Conclusion

- Answer your problem/purpose statement.
- What does it all add up to? What is the value of your project?
- What further study do you recommend given the results of your experiment? What would be the next question to ask?
- If you repeated this project, what would you change?



PROJECT REPORT

A report is the written record of an entire project from start to finish. When read by a person unfamiliar with your project, the report should be clear and detailed enough for the reader to know exactly what you did, why you did it, what the results were, whether or not the experimental evidence supported your hypothesis, and where you got your research information. A project report should be preferably typewritten, double-spaced, and bound in a folder or notebook. It should contain a title page, a table of contents, an abstract, an introduction, one or more experiments and data, a conclusion, a list of sources, and acknowledgments.

Title Page

The content of the title page varies. The title should be attention-getting. It should capture the theme of the project but should not be the same as the problem question.

Abstract

The abstract is a brief overview of the project. It should not be more than one page and should include the project title, a statement of the purpose, a hypothesis, a brief description of the procedure, and the results. There is no one way to write an abstract, but it should be brief. Often, a copy of the abstract must be submitted on the day of judging, and it is a good idea to have copies available at your display.

Introduction

The introduction is a statement of your purpose, along with background information that led you to make this study. It should contain a brief statement of your hypothesis based on your research. In other words, it should state what information or knowledge you had that led you to hypothesize the answer to the project's problem question. Make references to information or experiences that led you to choose the project's purpose.

Experiment and Data

List each project experiment in the experiment section of the report. Experiments should include the problem of the experiment, followed first by a list of the materials used and the amount of each, then by the procedural steps in outline or paragraph form. Write the experiments so that anyone could follow them and expect to get the same results.

Following each experiment, include all the measurements you took and all the observations you made during each experiment. Graphs, tables, and charts created from your data should be labeled and, if possible, colorful. If there is a large amount of data, you may choose to put most of it in an appendix, which can be placed in a separate binder or notebook. If you do separate the material, place a summary of the data in the data section of the report.

Conclusion

The conclusion summarizes, in about one page or less, what you discovered based on your experimental results. The conclusion states the hypothesis and indicates whether the data supports it. The conclusion can also include a brief description of plans for exploring ideas for future experiments.

Sources

Sources are the places where you obtained information, including all of the written materials as well as the people you have interviewed.

Acknowledgments

Even though technically your project is to be your work alone, it is permissible to have some help. The acknowledgments is not a list of names, but a short paragraph stating the names of people who helped you and how.