

Glossary of Terms & Explanations

Abstract: a summary of your entire project in 250 words or less. It must include your hypothesis, a brief explanation of the procedure for your experiment, a brief overview of your data (including numbers), your conclusion (including support/non-support of your hypothesis), and at least one real-world application. (See part 5, step 3)

Assessment of Safety Issues: a list of ALL safety concerns in your experiment. This includes dangerous/hazardous materials, equipment, and/or people/organisms involved in or observing your experiment. (See Part 5, Step 7)

Average: Also known as mean. To calculate, all the data from testing one level of the independent variable is added together and then the sum is divided by the number of trials.

Bar Graph: see graph

Conclusion: An in-depth summary of the results of your experiment and how they relate to your research and original hypothesis. The main question you should ask yourself when forming a conclusion is, “Do my results support my hypothesis?” If they do, why do you think they do? If they don’t, how are they different? And, why do you think they differ? ***Remember:*** It is **NOT** important for the hypothesis to be “supported.” It is important, however, that you explain ***why*** you got the results you did. Be sure to mention in your conclusion your major findings and what factors you believe contributed to your results. Then, briefly explain possibilities for new experiments that would control these factors. Also, mention any new investigative questions that came up during the experiment. These might guide other researchers who find your results interesting to want to study the topic more. Also, be sure to mention possible applications of your experiment and findings. (See Part 4, Page 3)

Constant Variables: The things in your experiment that stay the SAME throughout the experiment. When listing your constants, refer to your materials list. **EVERYTHING** (types, amounts, brands, etc.) that you use should stay the same throughout the experiment, **except for** the ONE thing you change on purpose. Remember to include location, temperatures, times, people, etc.

Control: This is used as a standard for comparison to see what affect changing the independent variable has on the experiment. For example, if comparing how different types of fertilizer affects plant height, then one group of plants need to grow without the fertilizer to see if the fertilizer even makes a difference. There are two types of controls: No treatment control and experimenter selected control. (See no treatment control and experimenter selected control below)

Data Analysis: An overall summary explaining what you learned from your data. It is the process of evaluating data using reasoning to examine each component of the data provided. In the analysis of your data, state in sentence form your data including the mean/average. Questions to answer in your analysis include, “What does the data tell me? What trends do I see in my graph(s)? Are the data for the control group different than the data for the experimental group? Why were these the results? Were there circumstances, limitations, or errors that might have affected or caused the results?” If so, discuss them as well as measures that were taken or could have been taken to control them. (See Part 4, Page 3)

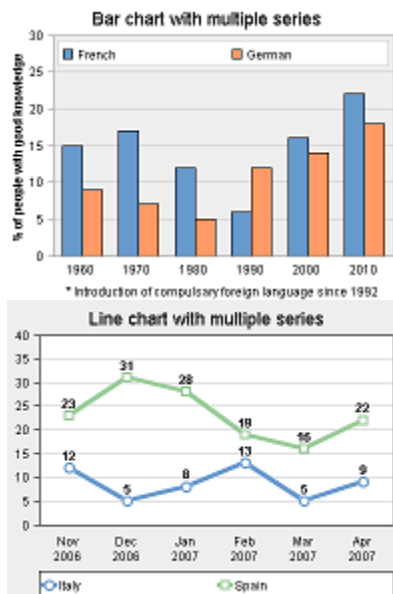
Data Table: a chart containing labeled rows and columns to neatly organize quantitative data collected during the experiment. Be sure to include a title that reflects the independent and dependent variables of your project [The Effect of (IV) on (DV)]
(See Part 4, Step 6 and 7)

	Height Plants Grew in Centimeters		
Temp of Water	Trial 1	Trial 2	Trial 3
Hot (35°C)			
Warm (21°C)			
Cold (5°C)			

Dependent Variable: What changes or responds to the change of the independent variable. It is what you measure as a result of the change in the independent variable. Your dependent variable **MUST** be measurable, meaning it has a number and a unit. It is possible to have more than one dependent variable in an experiment. For example, if I want to see how baking soda or salt mummifies a hot dog, you could have 3 dependent variables: how the mass changes, how the circumference changes and how the length changes.

Experimenter-Selected Control: In this case, it does not make sense to test the experiment without the independent variable. For example, if comparing which brand of batteries lasts the longest, then to run a test “without” batteries would be foolish. So in this case, the experimenter (you) would simply pick which level of the independent variable you want to act as the control. It is usually the most common type and is **ALWAYS** the first one you test.

Graph: A graph is a diagram that shows the relationship between two sets of points by having coordinates. It is also a pictorial device, such as a line graph or a bar graph, used to illustrate quantitative relationships. In a graph, the independent variable goes on the x-axis and the dependent variable goes on the y-axis. It is important that both axes are labeled with the variable **AND** the y-axis must be labeled with the unit of measurement. If you are measuring time, you **MUST** use a line graph. Otherwise, a bar graph should be used. See examples below. (See Part 4, Step 8 and 9 for specific requirements for final graphs)



****NOTE:** This graph is missing labels on both axes. You **MUST** label both axes. See above in definition.

Hypothesis: A tentative explanation for a scientific problem that can be tested for further investigation. A hypothesis takes one of the following formats:

- A. If the (independent variable) is (describe how you changed it), then the (dependent variable) will (describe the effect).
- B. If comparing (levels of the independent variable), then (dependent variable) will (describe how the dependent variable will change).

Independent Variable: the ONE thing you change ON PURPOSE in your experiment. By changing this one thing, you expect something else will happen.

Introduction: The introduction should be at least 2 paragraphs in length and contain a statement of your purpose, what you hoped to achieve with this study including how this project would benefit society in general, your hypothesis, and what research led you to choose that as your hypothesis. (See Part 5, Step 4)

Investigative Question: the question you are addressing in an experiment. It is also called the problem. It is the purpose written in question format. The format should take one of these formats: How does (independent variable) affect (dependent variable)? **OR** Which (independent variable) is the most (dependent variable)? (See Part 1, Step 1)

Levels of the Independent Variable: The number of experimental conditions tested. For example, if an experiment compares how hot water, warm water and cold water affect the height of plants, then the experiment has 3 levels of an independent variable b/c 3 different temperatures of water were tested. If an experiment tests how the amount of salt (using 0mL, 5mL, 10mL, and 15mL of salt) affects the density of water, then the experiment would have 4 levels of independent variable—4 different amounts of salt tested. THIS IS **NOT** THE SAME AS THE NUMBER OF TRAILS!

Line Graph: see graph

Materials: A list (one below the other) of the supplies, equipment, and tools AND amounts of each needed to conduct the experiment. It includes measurement tools like rulers and timers, cameras, observations tools like a magnifying glass and note taking materials like a journal and pencil. You MUST include the size, amounts, and/or brands of materials where appropriate.

For example, 2 100-mL graduated cylinders

(It must be included on the “Procedure” page of the Written Report. See Part 5, Step 8)

Mean: also referred to as average. See average.

Median: the middle most value when all measurements are listed in order from smallest to largest. This can be addressed in the data analysis. (See Part 4, Page 3)

Metric Units: A decimal system of units based on the meter as the basis unit of length, the gram as the basic unit of mass, the liter as the basic unit of volume, and the second as the basic unit of time.

MSDS: Material Safety Data Sheets. Students using any household product, chemical, etc. carrying a warning label or specific instructions on the use and/or disposal of the item must find, print and attach to the PPA, the Research Plan, and the Written Report. Go to www.msdssearch.com to find them. (See Part 3, Step 1)

No Treatment Control: A type of control in which all groups tested except for one receive the same “treatment” to determine the affect of the independent variable on an experiment. For example, if comparing how different types of fertilizer affects plant height, then one group of plants need to grow without the fertilizer to see if the fertilizer even makes a difference. The group without the fertilizer would serve as the no treatment control because it did not receive the same “treatment” as the other groups.

Plagiarism: to steal and pass off the ideas or words of another as one's own
(See Plagiarism: A Student’s Guide to Recognizing It and Avoiding It)

PPA: Procedural Plan of Action. This form outlines your experiment including your variables, materials list, safety issues, procedures and MSDS sheets. (See Part 3, Step 1)

Precautions of Safety Issues: Once you have “assessed” the safety issues (see “Assessment of Safety Issues”), you must list how you will protect yourself and others from those safety risks. You must address how you will properly and safely handle dangerous materials and equipment. You must also address how you will dispose of these materials. (See Part 5, Step 7)

Problem: Also known as the investigative question. See investigative question.

Procedural Plan of Action: Also known as PPA. See PPA.

Procedures: The step-by-step directions on how to perform your experiment. It’s like the recipe in cooking. It must be in step-by-step format, in list format (not in a paragraph) and numbered. They must be written using command statements like “Plant four seeds”, NOT “I planted four seeds.” Do not use first-person pronouns like I, me or my. They cannot include contractions, and they must include the materials used, amounts of each, safety concerns, metric measurements and units used in the measurement.

PLEASE NOTE: that if you are using an experiment off the internet, like Science Buddies, almost always the procedure has to be modified to how YOU will perform it. The procedures on Science Buddies, for example, are usually very vague. For example, it might say to put the baking soda in a plastic tub. You would change it to “Pour 400 mL of baking soda into a 500 mL plastic tub.” Procedures are first completed as part of the PPA.

PLEASE NOTE: In the Written Report, the procedures page includes more than just the procedures. It also includes the problem, materials listed and procedure.
(See Part 5, Step 8. See Part 3, Step 1. See also 5 Step 8.)

Purpose: This is your investigative question or problem written in a statement form. For example, if the problem is “How does salt affect the temperature at which water boils?”, then the purpose is “The purpose of this project is to determine how salt affects the temperature at which water boils.”

Qualitative data: Data collected using your senses. These are observations that you see, smell, touch, taste (do NOT taste experiments without permission from the teacher—a safety issue), or hear. For example, the temperature is warm and the plant is short. Other examples: the car curved right or the leaves turned brown.

Quantitative data: Measurable data that includes both a number and a unit. For example, the temperature is 25°C, or the plant is 12 cm tall.

References: Also known as the bibliography. These are the sources you use to gain background knowledge on your subject as well as the site where you found the experiment. You must have a minimum of 6 sources. They may include sources such as websites, articles, books, journals, and experts. Dictionaries or encyclopedias **CANNOT** be used. They must be alphabetized and documented in MLA format. (See Part 2, Step 1 and 4. See also Part 5, Step 12)

Research: This is done after you have chosen a topic to gain background knowledge about your topic/project. It helps you to create your research-based hypothesis as it provides the “because” part of the hypothesis. Research is generally documented in the journal using notecards. On the notecards, you summarize in YOUR OWN WORDS the information read and document the sources as you research. (See Part 2)

Research Notes: Research notes are summaries of your articles, books, etc that you have read to gain background knowledge. They are recorded on notecards and attached in the science project journal. (See Part 2)

Research Plan Attachment: A summary of your experiment required as part of your state forms which are used by the SRC committee for project approval. It includes the investigative question (problem), hypothesis, step-by-step procedures including safety issues and MSDS, data analysis and 6 (or more) references (in ABC order and MLA format).

Results: includes data tables and graphs

Review of Related Materials: This is the title of your research paper. It must be typed, 2 pages in length, left justified, Times New Roman, font size 12 or 14. (See Part 2, Step 3 and 5)

Safety Equipment: After assessing the safety concerns, safety equipment such as goggles, aprons, and gloves might be used to reduce the risk of injury. (See Part 3, Step 1)

Safety Precautions: See Assessment of Safety Issues & Precautions of Safety Issues. (See Part 3, Step 1)

Title: There are two parts of your title. The first part is a short, catchy title that should appear largest on the title page of the Written Report. The second part, “The Effect of (IV) on (DV)”, should appear slightly smaller below the first part on the title page of the Written Report. (See Part 5, Step 1)

Trials: The number of times you tested each level of the independent variable. You must do a minimum of 3 trials. Additional trials may be performed for extra credit. The more trials completed, the more valid your conclusion. **NOTE:** Human projects have different trial requirements. You will be given those at the mandatory parent meeting. (See Part 4, Page 1)

Uncontrolled Variables: Variables in your experiment that you cannot control. For example, if you are growing plants and the temperatures drops below normal for a night or two, you must do your best to protect the plants but this temperature change is something you cannot control.

Variables: There are several different kinds of variables: independent variable, dependent variables, constant variables, control variable and uncontrolled variables. These are each defined within the glossary.

Written Report: This is the final report that you turn in for a grade in a 3-prong 2-pocket folder. It is **NOT** handwritten, but it is a typed report including the title page, table of contents, abstract, introduction, review of related materials (research), variables, safety precautions, procedure (see all that is included here), results: data table, results: graph, data analysis, conclusion, references, photographs and science project journal. (See Part 5 for specific requirements for each)