Research Paper for Scientific Method Project

*Title Page and Table of Contents should each be on a separate page followed by the text of the research paper. Do Not use a separate paper for each section of the text (Intro, Hypothesis, Materials, etc)*

**Title Page** (1 page) – Your title should take up most of a page. Use creative illustrations to indicate the nature of your project in picture form. In lower righthand corner put: your name, Project Category, Project I.D. code (Do not put “Seton School” or any other information).

**Table of Contents** (1 page) – Identify all Sections of the Paper listed here. Indicate on which page of your paper each section can be found. (Do Not have to list Title Page). Note: more than one section can be found on one page (Do not use a new page for each section)

**Introduction**  (1 – 2 pages) – include problem, source of idea for project, personal observations, research specific to the scientific principles supporting your project, purpose for doing the experiment, any potential benefit to society from your work (Details about experimental design or plan for procedure are NOT included here).

**Hypothesis** (1-2 sentences) make sure to state any assumptions (“If plants can absorb sugar through their roots, ...”). Design your hypothesis to be able to disprove it where possible (if you think plants can benefit from sugar in water given through the soil, then design your hypothesis to state the opposite and hope to disprove it. (If plants cannot benefit from sugar given through the soil, then plants given sugar water will not grow faster and be healthier than plants given water without sugar”).

Be sure to be complete. Your hypothesis should include both independent variable but also the dependent variable

If you are comparing substances, mention them. Do not say “Substance A will be the greatest”. That implies that you will be testing every possible other substance. Instead, describe what Substance A will be compared to. (Do not say “The salt solution will harm the plant the most.”)-This implies that the reader already knows what you are going to do. Instead say “A 10% salt solution will cause potted geraniums to show damage to leaves more severely than a 10% sugar solution or 10% starch solution.”)

**Materials** (variable)-

list all materials used in column format- do not number the list. make and model # of special equipment use ® for brand name items questionnaire or quiz used (attach copy) copy of a script if used in project

copy of any pictures to be shown identify any songs or music to be used

**Method (or Procedure)** (variable)

1. give a numbered step-by-step description of what was done in the order in which it was done.
2. Use 3rd Person, Past Tense, Passive Voice (“Papers were given to participants” not “I passed papers out”).
3. Be sure the description is detailed enough to allow another person to repeat your experiment exactly.
4. Describe the procedure for one independent variable, clearly explaining the levels of that variable that you have tested.
5. Identify the control.
6. State how many trials were run for each level of independent variable.
7. If you included more than one independent variable, show how each variable was tested by itself in turn. (Essentially, you have conducted more than one experiment if you used more than one independent variable.)
8. State what information (data) you have recorded, including the units used for measurement. If you have developed a qualitative scale for measurement (eg “scale of plant health 0-5”) you must state exactly what each number of your scale represents.

**Experimental Design** Identify each of the following: Independent Variable, Levels of Independent Variable, Control Group, Constants, Dependent Variable (outcome), Number of Subjects / Trials / Repetitions

**Results**:

**Data Collection** – (show tables of raw or grouped data)

Title = dependent variable with units (describes the information placed in the cells of the table)

Labels for rows = Levels of Independent Variable (include a row for the control group)

Column Headings = Each trial (plant, participant, or experimental trial). The last column can be reserved for a mathematical analysis of results in each row (mean, mode, median, differences, etc) Entries in boxes = The actual data that is recorded is placed in the cells (boxes).

A short description of the notable results should be written in paragraph form to accompany the table. (Tell the reader what to look at in your tables.)

**Data Analysis** - (graphs showing an interpretation of your ANALYZED data).

Title = The title for each graph should state the form of analysis used for Dependent Variable (e.g. “Average change in mass of samples”).

Label x-axis (Independent Variable in general, with levels of Independent variable detailed).

 Label the y-axis with units used for the dependent variable.

Describe in paragraph form what the reader should see in your data. Indicate what is most striking to you about your data.

**Discussion** Explain how you have interpreted your data (in reference to your background research) and how these results might potentially impact individuals, the community, or the world. Mention that your results validate other researchers work, if it does. If you found data that disagrees with the work of other researchers in this field, say so. If an area of unresolved research has been clarified through your work, say so. If you would change anything about your experiment to improve it, consider mentioning it here. If your work reveals bigger and better work to be done in answering a question, mention that here.

Examine any possible sources of error in your work and discuss how these may impact interpretation of your work. Suggest improvements to your experimental design that might reduce or eliminate these possible errors.

Discuss the scientific theory behind your experiment again (first outlined in the “introduction” section of your Research Paper. Describe how your findings relate to what has been previously known / understood about this scientific principle.

**Conclusion** Conclusion is based on what was observed in experiment. Do not include speculation. State your conclusion in light of your original hypothesis. Summarize major finding(s) from experiment as they relate to hypothesis. Remember: your experiment can ONLY **disprove** your hypothesis or **support** your hypothesis. (Proving your hypothesis involves many repetitions of experimentation by many different scientists) You may *very briefly* summarize the key points of your results here and show that they support or disprove the hypothesis.

NOTE: DO NOT only say “My hypothesis was supported” or “My hypothesis was proven incorrect”

(- this will make the reader have to search out your hypothesis again to remember what you predicted.) . Explain what results of your project led you to this conclusion.

# Acknowledgements Mention anyone who provided a significant amount of help in a special capacity. It is not necessary to mention your science teacher or your adult supervisor since it is understood that they have guided you along the way.

# Bibliography Use proper format (MLA format) for all entries. Make sure you have at least 5 good entries (2 need to be non-internet sources)

## Note

1. Each of the above headings must be used in the paper (except “Title Page”)
2. The whole research paper should be in the **third person** (“The researcher ….” or “the investigator….” or “the experimenter….”).
3. Use the **passive voice** and **past tense**, since the experiment is completed. (“this was done” or “…… was noted” or “……. was found”)