

## DP Science Lab Guide

Please use the following list as a guide of the major components to your written lab reports. It is important to understand that this should be written as a report. This means you need to use complete sentences, proper language, and follow a logical format. All supporting information from outside sources needs to be fully documented.

### **EXPLORATION:**

- Introduction -- Optional (except on final report) -- introduce the topic and provide your personal reason for the choice of topic. Why are you choosing to do this investigation?
- Research question -- In a single sentence, clearly and specifically state the objective of the investigation. The research question needs to identify the independent and dependent variable. The question is often stated as “How does x affect y in \_\_\_\_\_ context?” The range of the IV and the method of measuring the DV should be included. If using biological material (bacteria, plants, etc.) include the scientific name in proper format *Genus species*.
- Background information -- Provide background information relevant to understand the topic being investigated. This includes any equations, reactions, or other scientific information to understand the purpose of the investigation. Other points to address:
  - Explain how your investigation links to the curriculum.
  - Include a justification for your design which includes personal significance. Why are you investigating this topic? (might also be included in the introduction)
  - Explain the background regarding the variables that you have chosen. Provide definitions and cited sources as appropriate.
- Hypothesis -- Write a clear hypothesis that uses scientific reasoning to justify the expected change in variables. Use “If... then... because...” format.
- Variables -- Clearly identify the independent, dependent, and relevant controlled variables. Each type of variable has specific requirements, as given below:
  - Independent variable: Give the intended levels of the independent variable and justify this choice of range. Explain how the independent variable will be manipulated and how it will be measured.
  - Dependent variable: State the number of times the dependent variable will be measured for each value of the independent variable. Explain how the dependent variable will be measured.
  - Controlled variables: Clearly explain how each relevant variable will be controlled and why it is necessary. If a particular variable is important but beyond your control, explain how you will monitor the value to ensure that it does not change significantly.
- Materials -- Write a list of required equipment. Give the precision and size where appropriate. Include quantities for each.
- Safety, Ethical, Environmental considerations -- Briefly state any important safety considerations and what should be done to ensure proper safety procedures. Where relevant, discuss any ethical or environmental considerations. If none of these points apply, include a statement to that effect.
- Method -- Write a step-by-step procedure for your experiment. Include a labeled diagram or photograph where appropriate. Be clear about the steps taken to monitor or

control variables and how to ensure sufficient data is collected. Discuss the use of a trial run to ensure a proper range for your independent variable.

### **ANALYSIS:**

- Data collection -- Organize all qualitative and quantitative data in a labeled data table. Qualitative observations recognize differences that are not quantitative and may be of use in evaluating your data. All tables should be numbered and include a descriptive title that identifies the variables and provides context. Units and uncertainty must be given for any quantitative data. Significant digits and uncertainty must be consistent. Include a note below each data table explaining how the estimated (measurement) uncertainty was determined.
- Data processing -- Include one labeled sample calculation of each type with units. Processed data should be clearly identified, including proper units and uncertainty. A graph should be created to visually represent the trend in the data. Graphs need a descriptive title, proper scale, labeled axes, uncertainty or error bars, and a best fit line.
- Interpretation—After the data tables and graphs, write a paragraph saying what all of this means. What patterns are there in the data? How does the data help answer the research question?

### **EVALUATION:**

- Conclusion – Refer to the research question explicitly and answer the question. Clearly describe the trend in the data using numbers whenever possible. Discuss whether the trend is affected by systematic or random error. Discuss the confidence in the result and compare to scientific theory. Where appropriate, compare to an accepted value using a proper method (percent error, for example). Accept or reject the hypothesis, with evidence.
- Evaluation -- Evaluate the strength and weaknesses of the investigation and results.
  - Discuss the strengths of the method. Discuss the reliability (repeatability) and validity (correctness) of the results.
  - Address sources of error. Error does not mean mistake. Use a new paragraph for each error. Discuss the source of the error, how it affected the trend line and/or results, and give a realistic suggestion to improve or eliminate the error.
    - Mistake -- something done incorrectly. Never acceptable as a source of error. If you make a mistake, fix it, then redo the trials.
    - Error -- a source of uncertainty in measurement. These may be caused by limitations in the equipment or procedure (systematic), or minor variations in the values you are trying to measure (random).
  - Discuss general issues with the experiment. Points to be considered are the range of the independent variable, number of trials, management of controlled variables, choice of equipment, etc.
- Extensions -- Discuss a logical extension of the experiment. It should be a realistic extension fully justified by the data and based on your conclusion. It is a logical “next step” that will further enhance the understanding of the original topic.

### **WORKS CITED:**

- List all sources of information, alphabetically, in proper MLA format.
- In-text citations have been included where appropriate.

- The works cited page is in alphabetical order.