Independent Research Project Guidelines

Elements of a successful research project from Intel Science Fair guidelines.

The Project notebook is your most treasured piece of work. Accurate and detailed notes need to be kept in your notebook. This may be a bit messy but shows consistency and thoroughness in research. A research paper needs to be prepared to go along your notes. A research paper helps organize data as well as thoughts. A good paper will have the following sections.

1. **Introduction** 
   1. Purpose of the research

provide the reader your reason or what prompted you to do the research.

* 1. Identify the Problem or Question

State the research problem or question in one sentence and should be very specific and measurable.

* 1. Background information

Research background information by answering these two questions found in research:

1. What information is currently known about the problem (i.e., what is the significance of the problem)?

2. Why is it important to address the problem?

* 1. Predict a solution to the problem or an answer to the question (Hypothesis).
* This solution design or hypothesis should be based on previously obtained knowledge or research and be supported by scientific evidence.
* Write a one sentence statement predicting the outcome of the experiment in an If…(independent variable) then….(dependent variable)
* The independent variable is the variable that is varied or manipulated by the researcher. The dependent variable is the measurable effect, outcome, or response in which the researcher is interested. In an experiment, the independent variable is the variable that is controlled and manipulated by the experimenter; the dependent variable is not manipulated but instead is observed or measured for variations.

1. **Design the experiment to be used to test your hypothesis (Materials and Methods).**

* Include a list of all materials used, be specific.
* Take all safety concerns into account.
* Identify a control to be used for comparison if applicable
* Control all outside variables that could affect the outcome of the experiment.
* Clearly define how the data will be collected and recorded, including measurement units. Your research paper should be detailed enough so that someone would be able to repeat the experiment from the information in your paper. Include diagram and pictures.

1. **Carry out the experiment (Results).** 
   1. Data and Observations

* Collect data.
* Design a data table to use to record information.
* Make qualitative and quantitative observations.
* Complete multiple trials. (Do the procedure many times, collecting data each time).
  1. Analyze the data.
* Make graphs or charts of the data to visually present data. Include statistics such as p-value, mean, and standard deviation.
* Check that the independent and dependent variables are properly placed on any graphs.
* Write in paragraph form, analysis should be explained clearly and concisely. Be logical and clear.

1. **Discussion.**

* This is the essence of your paper. Compare your results with theoretical values, published data, commonly held beliefs, and/or expected results. Include a discussion of errors. How did your data vary between repeated observations of similar events? How were your results affect by uncontrolled events? What would you do differently if you repeated this project? What other experiments should be conducted?

1. **State the conclusion (Conclusion).**

* Answer the original questions include a claim, accept or reject hypothesis; evidence, discuss the data; reasoning, make sense of the data as it relates to your hypothesis.
* The researcher fails to reject the null hypothesis. The evidence that supports this…. The reason for this may be due to….
* Write a brief paragraph supporting your conclusion. Summarize your results. State your findings in relationship of one variable with the other. Support those statements with data. Do not overgeneralize findings to the public, just discuss your sample group.

1. **References** – 3-5 sources with in-text citations, APA format.

**Abstract**

* The abstract should be less than 250 words and should include the following: a. purpose of experiment; b. procedure; c. data; and d. conclusions.
* Tips on writing a project abstract: 1. Emphasize purpose (hypothesis), methods, analysis and conclusion; 2. Use past tense and use short complete sentences; 3. Avoid jargon and omit specific details.

*\*Research paper should be Times New Roman Font Size 12*

*\*Poster should be 48”x36” and minimum 24 pt. font.*