Introduction to Experimental Design Template

1. Make Observations and Ask Questions or Recognize Problems: Use observations and information from this unit to recognize a problem and design an experiment to test the problem.

2. State the Problem: Each experiment must answer a question. What question will your group address? Write the question in this format:
   When I change __________________________ (independent variable), what will happen to __________________________ (dependent variable)?

3. Form a Hypothesis: Tell what effect you think the independent variable (the one you changed on purpose) will have on the dependent variable (the one that you observe or measure).
   a. the INDEPENDENT VARIABLE in our experiment is: __________________________
   b. the DEPENDENT VARIABLE in our experiment is: __________________________
   c. list at least 5 CONTROLLED VARIABLES in the experiment:________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________

d. My HYPOTHESIS for this experiment is (this should be worded in the format “If _____, then _____.”):
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

4. Experiment: Decide on a procedure to test the hypothesis.
   a. List your MATERIALS for the experiment (Be very specific):
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
      ______________________________________________________________________
b. List the **EXPERIMENTAL PROCEDURE** in specific, detailed steps. Each step should begin with an action verb just like in a recipe.

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5. **Collect and analyze the data generated from the procedure:** Decide how you will display the **RESULTS** of the experiment (example: data table, graph, photos of observations, etc.) Remember the importance of clear and complete presentation of results.

Title of Data Table_______________________________________________________________

<table>
<thead>
<tr>
<th>Independent Variable (unit)</th>
<th>Dependent Variable (unit)</th>
<th>Average (unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial 1</td>
<td>Trial 2</td>
</tr>
<tr>
<td></td>
<td>Trial 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
If you have numerical data, you should include a GRAPH. It should be drawn on graph paper (or computer generated at http://nces.ed.gov/nceskids/createagraph/) in the format shown below and attached.

Title of the graph: ____________________________

what I measured  
(specify units)  
(DEPENDENT VARIABLE)

what I changed  
(specify units)  
(INDEPENDENT VARIABLE)

Note: Both axes need to be labeled and appropriate units of measurement marked.
6. **Write a conclusion regarding the hypothesis:** The conclusion plain and simple is the answer to your question (problem). Write a paragraph that summarizes your experiment. You should include statements about each of the following in this order: (1) Rewrite the question you decided to investigate. (2) Write a sentence or two explaining what you did. (3) Write a sentence or two describing what you found out by doing the experiment. Be sure to describe that data and patterns you found. (4) Write an answer to the question and describe how you know. Also explain whether or not your hypothesis was supported by the data. (5) Be sure to list any sources of error that may have affected your results. (6) Finally, suggest other experiments you would like to do for further study.