

Components of the Experimental Design

Title: Give a name to your lab/experiment, one that suggests what the lab is about. The title can be creative – “The Root of the Problem” – How Roots Help Plants Survive.

Purpose: Give your reason(s) for doing the lab/experiment.

Background: Research should be done to gain knowledge about the factors being experimented with. Information should be given about the subject, concepts, or principles involved in the lab/experiment. This information should provide a basis for predictions to be made about the outcome of the lab/experiment. Your sources should be cited correctly.

Safety: List all measures needed to ensure safety in the lab/experiment.

Hypothesis: Provide an educated prediction about the outcome of the lab/experiment. Use the following format for writing a hypothesis: **S/PAR = situation/problem, action taken, results expected.** So the hypothesis should include the following: If (the situation/problem...) and (the action taken...), then (the expected results...).

Example – If a plant’s leaves are drooping and water is added to the soil of the plant, then the roots will absorb the water, send it up into the plant, and the leaves will stop drooping.

Materials: List all equipment needed to carry out the lab/experiment. Be very specific here. Tell “how much”, “how long”, “how many”, “size”, “length”, “type”, etc. Usually materials are listed in order of use. Pictures can be drawn to help explain materials.

Examples – 5 radish seeds 50 g regular potting soil
 5 30 mL cups 5 popsicle sticks
 100 mL tap water

Procedures: Provide a step-by-step plan of action. Be very specific here. Tell “how much”, “how often”, “how long”, etc. You want to give a detailed procedure so that someone else could repeat the process. Pictures can be included to show or clarify procedures. Be sure to identify the experimental factors in your procedure: independent variable, dependent variable, and the control(s)/constant(s).

Observations/Data/Results: Give a record of information gathered during the experiment. Pictures can be used to help explain findings. Always have both qualitative (descriptive words used to explain) and quantitative (numerical) data. Both qualitative and quantitative data should be presented in CHART/TABLE format.

Analysis: Interpret and evaluate your observations/data/results. Here is where an attempt is made to explain the results (what does the data show). A statistical description (percentages, averages, totals, etc) of the data is done. A graph is made to help interpret the data. Questions should be answered in this section. Data is compared and contrasted. Possible errors are discussed. Inferences are made.

Conclusion: Discuss whether the hypothesis is accepted or rejected and cite valid and substantial reasons why the results occurred the way they did. What patterns, trends, exceptions, and implications can be drawn from the results?

Experimental Design Checklist

Please use this checklist to proof your lab write-up before you submit for a grade.

- Checklist attached to write-up and completed.
- Write-up is typed, neat, free of scratch outs, and lab headings are highlighted.
- Write-up is done in third person (absolutely no: I, we, me, you, it, they, etc).
- Write-up is properly headed (name, date, class).
- Title of lab appears on top line of paper.
- Purpose is stated in clear fashion, in statement form.
- Background research is pertinent to the experiment. Information helps understand concepts of lab and helps make predictions. Sources cited.
- List of safety procedures is provided.
- Hypothesis is stated using **S/PAR** format with “if”, “and”, “then” dividing the parts of the statement. The hypothesis is clear and predicts the outcome of the experiment.
- Materials are listed, preferably in order of use, in columns. Exact amounts/types/time is given. Pictures are drawn to enhance understanding, if needed.
- Procedures:
 - Numbered, listed in sequence, clear, repeatable and very specific
 - Variables and controls are indicated
 - Drawings are used to enhance understanding, if needed
- Observations:
 - Reported/explained in paragraph form
 - Data collected both quantitatively (always in metric) and qualitatively (descriptive)
 - Data/results collectively found in chart/table format
- Analysis:
 - Clearly explains, evaluates results
 - Statistics are used to help in analysis
 - Data is compared/contrasted
 - Possible errors (made or potential) are discussed
 - Graph(s) made to illustrate data
 - Graph(s) are explained
- Conclusion:
 - State whether hypothesis is accepted or rejected and why
 - Data is presented to support all claims
 - All explanations are detailed
 - Patterns/trends/implications are discussed in detail