

# EXPERIMENTAL DESIGN TEMPLATE IB

## Defining the Problem and Selecting Variables

State the problem you wish to investigate.

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Briefly list or cite relevant research, past knowledge, inferences or observations about the problem that will help you formulate a workable hypothesis.

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Write a rationale-based hypothesis for your investigation (must be testable and falsifiable).

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Propose an experiment and predict what will happen when the experiment runs its course? Include the statistical test and probability to be used.

	<u>Statistical test</u>
	<u>Probability</u>

Independent Variable (manipulated or cause)

Units

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Dependent Variable (responding or effect)

Units

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Write a focused *cause & effect* title for your investigation paper. Place *Genus species* names in italics.

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Controlled Variables (constants)	Units	Possible effect(s) on results
1.		
2.		
3.		
4.		

**Controlling Variables** (Describe how you will manage the controlled variables listed above).

1.	
2.	
3.	
4.	

### Method for Collecting Data checklist

- Include details of how to measure your independent and dependent variables.
- Give precise details of values, units and equipment.
- Make sure you collect enough data—how large does your sample size need to be?
- How many times will you repeat your investigation to ensure reliable results?
- What will you do with your data? (Graph type / statistical test)?
- Make a drawing or take a digital photo of the set-up and label all of the equipment and materials used.

### Recording Raw Data checklist

- Before collecting data, make a large, clear table for your raw (unprocessed) results.
- Write a descriptive heading at the top of each table.
- Give each table a number in the order in which you refer to it in the text (Table 1,2, and so on).
- Include units and uncertainties (tolerances) in your data table.
- Complete the table as you go—don't leave it on scraps of paper.

### Processing Raw Data checklist:

- Processing includes computations such as adding, subtracting, multiplying, and dividing.
- Include an example of any calculations performed when using composite equations.
- Check your calculations to avoid any silly mistakes.

### Presenting Processed Data checklist:

- Presentation includes spreadsheets, tables, graphs, illustrations, charts, flow diagrams, and so on.
- Graphs need to have appropriate scales, labeled axes and units, and accurately plotted data points.
- Below each graph, illustration, diagram or chart, provide a number in the order in which you refer to it in the text (Figure 1,2, and so on). Include a caption that briefly describes what the figure is about.
- Inclusion of SI units is expected for final derived quantities along with uncertainties where relevant.
- Express derived quantities to the correct number of significant figures.

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**Concluding checklist:** (you might not need to answer all of these)

- Interpret your results, based on the data collected and with reference to your hypothesis or background information.
- What (if any) general trends do you observe? What do they suggest?
- Are there any anomalous (unusual) results? What might be their cause / significance?
- Do the data you collected support your hypothesis? Why / Why not?
- What do your data suggest about the outcome of your research question?
- Do other sources of information or investigations support your findings? (Cite your source!)
- How could you develop this investigation for further study?

**Evaluating Procedure(s):**

*This must be a worthwhile evaluation of the method chosen, rather than a superficial commentary on poor lab techniques and sloppy work. "I should measure more accurately" is a problem with your practical skill, rather than the method of the investigation.*

- Did you record any anomalies in your practical work? How did they affect your results and what did you do to minimize their adverse effects?
- What weaknesses were present in the method chosen for the investigation and how could they have affected the outcome? (Example: instrument precision, accuracy, time management).
- Did anything occur during the investigation to compromise the reliability of your results?

**Improving the Investigation:**

- For each of the weaknesses or limitations mentioned above, describe a workable, realistic method to remedy the problems caused. (Example: modifying experimental techniques, data ranges)

**References (or Bibliography):**

- Using the Harvard method, or something similar, cite all sources used in your research for this investigation.
- Be consistent in your method.
- For more information, see the section titled 'Academic Honesty.'

**Appendix:**

*You may want to include:*

- Raw data or lab notes
- Article / research cuttings
- Practical protocols from other sources (where 'Design' is not being assessed)