How to Write an Experimental Design in Science

What is an Experimental Design?

An experimental design is the list of steps you take to do an experiment, and it is in the order that you do them in. They must include every step and be very detailed. An Experimental Design is divided into two sections: Materials and Methods.

How do I write a strong Materials section?

You're merely stating exactly the materials used to testing your hypothesis.

- What materials did you use? Be precise in providing quantity, size, etc…Remember that this section of your lab report is like the directions for baking a cake. You need to be specific so that someone else can repeat your experiment and have the same outcomes that you experienced.

Ways to improve my Materials:

Review the grading rubric below for the difference between accomplished, developing, and not met.

	Accomplished	Developing	Not Met
Materials	The researcher listed the materials with amount and size that were used to perform the experiment.	The researcher listed the materials that were used to perform the experiment.	The researcher did not list the materials that were used to perform the experiment.

Materials Samples

Accomplished	Developing	Not Met
500 ml of de-ionized water 1-stopwatch with 0.1 sec accuracy 1-AA alkaline battery	De-ionized water 1-stopwatch AA alkaline battery	Water Watch Battery

How do I write a strong Methods section?

You're merely stating exactly how you went about testing your hypothesis.

- How much detail? Be precise in providing details, but stay relevant. You should give as many details as necessary to prevent this experiment from going awry if someone else tries to carry it out.

- Rationale: Be sure that as you're relating your actions during the experiment, you explain your rationale for the protocol you developed.

If you capped a test tube immediately after adding a solute to a solvent, why did you do that? Explaining the rationale indicates that you understand the reasons for conducting the experiment in that way, and that you're not just following orders. Critical thinking is crucial—robots don't make good scientists.

Ways to improve my Methods:

Review the grading rubric below for the difference between accomplished, developing, and not met.

	Accomplished	Developing	Not Met
Methods	The researcher explained the experimental process with specific details and measurements so that the reader could recreate the investigation.	The researcher explained the experimental process of the investigation.	The researcher did not explain the experimental process.

Methods samples

Accomplished
1. Number each battery so you can tell them apart. 2. Measure each battery's voltage by using the voltmeter.

3. Put the same battery into one of the devices and turn it on.
4. Let the device run for thirty minutes before measuring its voltage again. (Record the voltage in a table every time it is measured.)
5. Repeat #4 until the battery is at 0.9 volts or until the device stops.
6. Do steps 1–5 again, three trials for each brand of battery in each experimental group.
7. For the camera flash push the flash button every 30 seconds and measure the voltage every 5 minutes.
8. For the flashlights rotate each battery brand so each one has a turn in each flashlight.
9. For the CD player repeat the same song at the same volume throughout the tests.

Developing

1. Get batteries.
2. Measure each battery's voltage.
3. Get a battery and put it in one of the devices and turn it on.
4. Let the device run for thirty minutes.
5. Measure its voltage again.
6. Do steps 1–5 again, three trials for each brand of battery in each experimental group.

Not Met

1. Get batteries.
2. Run test.
3. Record data.
4. Make a graph.
5. Complete an analysis, conclusion, and sources of error.