

8.0 CONDUCTING THE EXPERIMENT

Once your experimental design is complete, it is the time to perform the experiment. Plan and organize the experiment. Perform the experiment under controlled conditions. Keep careful records in the bound scientific notebook. The notebook is for your records and notes. If anyone else writes in it, have that person sign and date his or her entry.

Document everything you do, whether talking to a person about the project, visiting a library for research, or doing the lab work.

8.1 BEFORE YOU START YOUR EXPERIMENT

Organize all material and equipment to be ready for use as you need them. Organizing your work before starting is important.

Outline the procedure and make a timeline. An outline of the proposed timeline to complete each part of the experimentation is helpful.

- Can the entire experiment be completed at one time? Are multiple time slots needed for completion of experimentation? If so, what plans need to be made for securing materials between the experimentation sessions?
- What do you need to measure results? Are the measuring devices in metric units? Do you know how to read them? Do the instruments give accurate measurements?
- Do you need other people with you while doing the experimentation? Have you talked to those people about scheduling an appointment at a time convenient for everyone involved so that the experimentation can be carried out?

Keep your scientific notebook/log and graph paper handy. Design and set up the tables and graphs you expect to use prior to starting your experimentation. Include units where appropriate.

Keep a camera on location. The camera is a useful tool for documenting your project. Have another person take photos of you performing the experiment, and use the camera to record the progress and the results of experimentation.

Complete all certification forms and compliance forms. Make certain you have completed the Research Plan and all necessary forms for restricted areas and obtained proper approvals *before* experimentation begins.

Observe safety rules. Cover safety issues with your teacher and, if appropriate, with the research scientist and/or lab instructor at a research facility. Do not use any equipment that is unfamiliar to you; learn to use it before beginning the experiment.

8.2 BEGIN EXPERIMENTATION

Make entries in your scientific notebook as you go. Record data, both quantitative and qualitative, in your logbook. Sometimes what appears to be irrelevant or a failure on one day may become important information at a later date.

Enter measurements in your tables. As you proceed with your project, make certain you include the units and the degree of uncertainty of each measurement based on the exactness of the measuring device. Record your error as a +/- to indicate the amount of uncertainty.

Make repeated measurements periodically. Some experiments (e.g., plant-growth projects) require repeated measurements over an extended period. Take measurements periodically (e.g., every day at 4:00 PM, every third day at noon) to reduce extraneous variables, and make entries into the log when you make the measurements.

Repeat the experiment, if necessary. After completing the experiment, you may decide you need to repeat the experiment for accuracy of your results. You may need to clarify or even alter the hypothesis, redesign the experiment, and get ready to begin again. You may learn more from the process of revision than you learn when all goes "perfectly." Remember, do not discard or remove any data from your scientific notebook/logbook. These pieces of data are often valuable later. Talk with your teacher or supervisor about improvements and, if necessary, begin the experiment again.

When other people make entries or comments in the scientific notebook/logbook. Material put in the scientific notebook/logbook by someone else must be acknowledged clearly, and that person's signature must be in clear view and dated.

Engineering/Computer Project Considerations

If you are doing an engineering project, after you have defined the need, developed design criteria, and done the literature search, you should:

- prepare preliminary designs
- build a prototype
- test the prototype
- retest and redesign as necessary