

Designing your own experiment

If you ever design your own experiment, then, you should go through this mental process:

1. What do I want to study?
 - a) What are the characteristic properties of this subject?
 - b) Which of these properties are open to manipulation?
 - c) Are these properties measurable?
 - d) Is the equipment to measure it available?
- 3) Is this study appropriate for my level of understanding and experience?
2. Can I restrict the experiment to one manipulated variable?
 - a) How do I control the other variable that will affect the property I want to study (responding variable).
 - b) What physical quantities is the measurement most sensitive to? (This includes but is not limited to the thing you're trying to measure. For example, some of your equipment might be sensitive to changes in temperature.)
 - c) Are any environmental factors which could affect the value of this quantity?
 - d) Are there any other sources of the thing I'm measuring present? If so, how can I isolate the experiment from these effects? If I can't get rid of the systematic error, can I measure it and account for it later?
3. Is there only one responding variable?

Of course, there always remains the possibility that a systematic error is present which you haven't thought of. To account for this, scientists will **calibrate** their instruments and, if possible, the experiment itself. Calibrating means that you use your equipment to measure a series of known quantities and see whether your apparatus gives you the correct answers. By doing this, you measure the amount of systematic error directly. If your experiment has more than one independent variable (for example, if you were studying a sample of galaxies of varying size and ellipticity), this technique can get very time-consuming!

One should be cautious when using this method to correct results outside the domain which you've calibrated. There's no way to know whether other effects would become important in the new region, and the shape of your curve might change drastically