

INTRODUCTION TO

LECTURE OUTLINE
Experimental Design

Professor Leibon

Math 10

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Goal

Design a "Coke-Pepsi" challenge

Recall: A Scientific Method

1. Articulate a question.
2. Assemble and evaluate relevant information.
3. Design an investigation or experiment.
4. Carry out the investigation or experiment.
5. Draw (tentative) conclusions.
6. Repeat 1-5 till you "run out of steam" or your conclusions cease to be tentative.
7. Communicate you findings.

Design an investigation or experiment. Things to bear in mind:

1. Make a careful design and **record all design changes**.
2. Report every aspect of the results, being especially careful to report every measurement you considered and to describe **all** the information collected and/or analyzed ("Multiplicity").

When Possible:

1. Pre-test, pre-test, pre-test!
2. Assign treatments randomly.
3. Perform the experiment blind or better yet double blind.
4. Set up treatments and controls groups if possible in a paired design (potentially crossover), and if not possible as a parallel design (this is very typical) .
5. Pick samples randomly (keeping in mind the possibility of confounding factors).

Sampling Types:

1. Random.
2. Systematic.
3. Stratified.
4. Cluster.
5. Convenience.

Beware of:

1. Confounding factors. **Def:** A Confounding factor is a difference between the treatment and control groups (other than the treatment) which affects the responses being studied).
2. Self selected samples. (Samples not obtained randomly).
3. Observational and retrospective studies (treatment not assigned randomly).
4. Bias: selection, publication and response.
5. Residual and period effects.

When interpreting the relationship between your results and your question, keep in mind:

1. Association does not imply causality.
2. Placebo type effects (and claims of).