

Statistical Techniques II

EXST7015

Experimental Design Identification



Experimental Design Identification

- **To correctly design an experiment, or to analyze a designed experiment, you must be able to look at a design situation and correctly assess the salient aspects of the design.**
- **I will ask you to identify the design, the treatment variable, dependent variable, degrees of freedom error, experimental unit, sampling unit (if any), and if the treatment is fixed or random.**

Design Ident (continued)

- **To begin with, determine what the investigators are trying to do and what they plan to measure.**
 - ▶ **What is the Objective of the study?**
 - **Specifically, what hypotheses are to be tested?**
 - ▶ **What is the variable of interest?**
 - ▶ **What unit is the treatment applied to?**
 - ▶ **What, exactly, is the unit measured?**

Design Ident (*continued*)

- **Suppose an investigator wants to compare the oxygen levels in seven predefined "habitats" in the Louisiana marsh. He will randomly select and sample 4 sites in each habitat. One oxygen measurement is made at each site.**
- **What are the treatments? What is the investigator interested in comparing?**
 - ▶ **Treatments? Habitats (t=7)**

Design Ident (*continued*)

- **Are there any sources of variation that should be recognized, but which are not important to the investigator. For example, did he replicate the experiment in several locations along the coast?**
 - ▶ **Blocks? Apparently none.**
- **What sampling unit is associated with the treatment? What unit was the treatment applied to or what was sampled for each treatment (habitat)?**
 - ▶ **Experimental unit? A site (s=4)**

Design Ident (*continued*)

- **What is the sampling unit at each site?**
In this case it is a water sample on which oxygen is measured. Since there is only a single sample at each site we can consider each sample to represent the site.
 - ▶ **Sampling units.** **A site**
 - ▶ **If there were multiple samples taken at each site these would be the sampling units. These in turn can be split into sub-sampling units.**

Design Ident (continued)

- **Is that all? There are other issues, not all of which we have covered.**
 - ▶ **Are the treatments fixed or random?**
 - ▶ **Is the design balanced?**
 - ▶ **Are there any particular hypothesis tests of interest (contrasts)? Are the treatment levels quantitative?**
 - ▶ **Any other special post ANOVA applications?**

Daily Design Objectives

- **The topic of Design will be discussed in the second half of the course. For the moment our objective is only to learn to identify the components of an experiment.**
- **Therefore, I will put a design description on the Internet and each class period ask you to have looked at it and to be prepared to answer the following questions.**

Daily Design (*continued*)

- **Questions I will ask:**
- **What is the treatment arrangement for this experiment?**
 - ▶ **(a) single factor (b) factorial (c) nested**
- **What is the experimental design for this experiment?**
 - ▶ **(a) CRD (b) RBD (c) LSD (e) Split-plot (d) Repeated Measures**

Daily Design (*continued*)

- **Does it seem more likely that the treatments are fixed or random?**
 - ▶ (a) fixed (b) random
- **What is the experimental unit for this experiment?**
 - ▶ (a) site (b) habitat (c) water sample (d) oxygen
- **What is the sampling unit for this experiment?**
 - ▶ (a) site (b) habitat (c) water sample (d) oxygen

Daily Design (*continued*)

- **What is the dependent variable for this experiment?**
 - ▶ (a) site (b) habitat (c) water sample (d) oxygen
- **If there are blocks in the design, what are the blocks?**
 - ▶ (a) site (b) habitat (c) water sample (d) oxygen
- **How many degrees of freedom are available for testing the treatments?**
 - ▶ Enter the correct value here: _____

Daily Design (*continued*)

- For the little experiment discussed the source table is:

▶ Source	d.f.
▶ Treatment	6
▶ Error	21
▶ Total	27