

Experimental Research Designs

Chapter 9, pt 1



Experimental Research

- Purpose
 - To make causal inferences about the relationship between the independent and dependent variables
- Characteristics
 - Direct manipulation of the independent variable
 - Control of extraneous variables
 - Eliminate the variable from the study
 - Statistically adjust for the effect of the variable



Experimental Research

- Difficulties
 - Difficult to carry out in educational settings
 - Difficult to control all factors that might affect the outcome
- Consumers should know the limitations associated with a study to judge the usefulness of the findings



Experimental Validity

- Two issues
- Internal validity
 - The extent to which the independent variable, and not other extraneous variables, produce the observed effect on the dependent variable
- External validity
 - The extent to which the results are generalizable



Internal Validity

- Internal validity is discussed in terms of factors, called threats, that reduce the level of confidence in any causal conclusions
- Eleven (11) specific threats
 - History
 - Extraneous events have an effect on the subjects' performance on the dependent variable
 - The crash of the stock market, 9-11, the invasion of Iraq, etc.



Internal Validity

- Eleven (11) specific threats (continued)
- Selection
 - Groups that are initially not equal due to differences in the participants in those groups
 - Positive and negative attitudes, high and low achievers, etc.
- Maturation
 - Participants' maturation over the course of the study
- Pretesting
 - The effect of having taken a pretest



Internal Validity

- Eleven (11) specific threats (continued)
- Instrumentation
 - Poor technical quality (i.e., validity, reliability) or changes in instrumentation
- Treatment replications
 - Insufficient replications of the treatment
- Subject attrition
 - Differential loss of participants from groups
- Statistical regression
 - The natural movement of extreme scores toward the mean



Internal Validity

- Eleven (11) specific threats (continued)
- Diffusion of treatment
 - The treatment is given, usually inadvertently, to the control group
- Experimenter effects
 - Different characteristics or expectations of those implementing the treatments across groups



Internal Validity

- Eleven (11) specific threats (continued)
- Subject effects
 - The effects of being aware one is involved in a study
- Four types
 - Hawthorne effect
 - John Henry effect
 - Resentful demoralization
 - Novelty effect



Internal Validity

- Control of effects through the choice of specific research designs
- Interpretation of the results is tempered by the existence of internal validity concerns



External Validity

- Five factors affecting external validity
- Participants
 - Representativeness of the sample in comparison to the population
 - Consistency of the results across subgroups within the sample
 - Personal characteristics of the participants
 - Participant's awareness of being involved in a study



External Validity

- Five factors affecting external validity
- Situations - characteristics of the setting
 - Specific environment
 - Special situation
 - Particular school
- Time - explanations can change over time
- Treatments - specific way in which an experimental treatment is conceptualized, operationalized, and administered



External Validity

- Five factors affecting external validity
 - Measures
 - Different instruments measure content or constructs differently
 - Measures change across studies
- Control of both types of threats through sampling procedures
- Generalization of results is tempered by external validity concerns



Experimental Designs

- Four types of designs
 - Pre-experimental
 - Quasi-experimental
 - True experimental
 - Factorial



Experimental Designs

- Notation
- **R** indicates random selection or random assignment
- **O** indicates an observation
- Test
- Observation score
- Scale score
- **X** indicates a treatment
- **A, B, C, ...** indicates a group



Pre-Experimental Designs

- No pre-experimental design controls internal validity threats well
- Single group posttest only
 - A X O
 - Internal validity threats
 - History, maturation, attrition, experimenter effects, subject effects and instrumentation are viable threats
 - Useful only when the research is sure of the status of the knowledge, skill, or attitude being changed *and* there are no extraneous variables affecting the results



Pre-Experimental Designs

- Single group pretest posttest
- **A O X O**
- Internal validity threats
 - Maturation and pretesting are threats
 - History and instrumentation are potential threats
- Useful when subject effects will not influence the results, history effects can be minimized, and multiple pretests and posttests are used



Pre-Experimental Designs

- Non-equivalent groups posttest only
- | | | |
|----------|----------|----------|
| A | X | O |
| B | | O |
- Internal validity threats
 - Selection is a threat
 - History, maturation, and instrumentation are potential threats
- Useful when groups are comparable and participants can be assumed to be about the same at the beginning of the study

