

Research Methodology Research Design Comprehensive Exam Study Guide

References

Key Textbooks:

- Gay, L. R., Mills, G. E., & Airasian, P. W. (2012). *Educational research: competencies for analysis and applications* (10th ed.). Boston: Pearson.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2001). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

Optional:

- Borg, W. R., & Gall, M. D. (1983). *Educational research: An introduction* (4th, ed.). N.Y.: Longman.
- Cox, D. R. (1958). *Planning of experiments*. N.Y.: Wiley.
- McGuigan, F. J. (1983). *Experimental psychology: Methods of research*. (4th. ed.). Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Outline

- Scientific method, types of research, and types of variables
 - action research, analytic research, applied research, attribute variable, basic research, categorical variable, causal-comparative (ex post facto), classification factor, concept, construct, continuous variable, control variable, correlational research, criterion variable, deductive reasoning, dependent variable, descriptive research, evaluation research, experimental research, extraneous variable, field study, independent variable, inductive reasoning, intervening variable, quantitative research, qualitative research, manipulated variable, moderator variable, objectivity, operational definition, prediction study, predictor variable, random variable, research, research method, science, scientific method, variable.
- Research problem, plan, and hypothesis
 - alternative hypothesis, assumption, hypothesis (directional, non-directional), null hypothesis, pilot study, plausible rival hypothesis, problem statement, research problem, research hypothesis, statistical hypothesis, theory.
- Population, sample, sampling methods, sample size, and unit of investigation
 - accessible population, cluster sampling, convenient sample, critical discrepancy, degree of falsity, experimental unit, hypothetical population, informed consent, non-proportional sampling, precision, relative efficiency, power of a statistic, proportional sampling, residual standard deviation, sample, simple random sampling, stratified random sampling, systematic sampling, target population.
- Non-experimental research
 - case study, content analysis, correlational research, cross-sectional approach, developmental study, document, ethnographic research, explanatory observation, historical research, (standardized) interview schedule, longitudinal research,

observational approach, primary observation, substitute primary observation, self-selection, supplementary observation for..., survey research.

- Characteristics, assumptions, and steps of experimental research suggested readings:
 - additivity, constancy of treatment effect, causation, comparative experiment, control, control (comparison) group, experiment, experimental error, experimental design, experimental (treatment) group, experimental variable, manipulation, independence, random error, systematic error, treatment, verification.
- Internal/external validity of a study
 - bias, carry-over effect, Compensatory equalization of treatments, compensatory rivalry, confounding, construct validity (putative cause/effect), diffusion of treatment, ecological validity, expectancy effects, experimenter bias, generalization, halo effect, Hawthorne effect, (threat of) history, imitation of treatment, interference between units, (threat of) instrumentation, interaction (selection X maturation, selection X treatment, testing X treatment), intra-session history, John Henry effect, (threat of) maturation, mortality, multiple-treatment interference, nonreactive, novelty effect, order effect, placebo effect, population validity, precision, reactive arrangement, reactive effect of testing, regression effect, representativeness, resentful demoralization, selection bias, sequence effect, specificity of variables, statistical conclusion validity, threat of testing, unobtrusive measure.
- Randomization and other methods of control
 - analysis of covariance, blocking, counterbalancing, double-blind technique, matching, matched-group, matched-pair, method of constancy, method of removal, random assignment, randomization, random permutation, random selection, replication, restricted randomization, using subjects as their own control.
- Statistical concepts required for understanding designs
 - alpha level, baseline, Beta weight (regression coefficient), chi-square, coefficient of determination, confidence interval, consistent estimator, contingency table, contrast, critical value, curvilinear relation, data, degree of freedom, descriptive statistics, efficient estimator, error rate, estimator, expected value, exploratory data analysis, family-wise error, F- test, frequency distribution, frequency polygon, histogram, inferential statistics, interval scale, level of significance, linear relation, mean, measurement scale, measurement of central tendency, measures of variability, median, meta-analysis, mode, multiple correlation, negative relationship, negatively skewed, nominal scale, nonparametric statistics, normal distribution, one-tailed test, ordinal scale, parameter, parametric statistics, percentile, percentile rank, planned comparisons, positive relationship, positively skewed, post hoc (multiple) comparison, probability, range, ratio scale, residual, sampling distribution, scatter plot, slope, skewed, spurious correlation, standard deviation, standard error of a statistic, standard scores, statistical significance, transformation, T-scores, t-test, two-tailed test, type I error, type II error, unbiased estimator, variance, z-score.
- Designs classified in terms of the degree of control
 - intact group, multiple time-series design, nonequivalent control group design, one-group pretest-posttest design, one-shot case study, posttest-only control group design, pre-experimental design, pretest-posttest control group design, quasi-experimental

design, Solomon four- group design, static-group comparison, time-series design, true-experimental design.

- Randomized-group designs
 - analysis of variance, between-group design, error term, error variance, fixed effect model, mean square between, mean square total, mean square within, mixed effect model, sum of square between, sum of square total, sum of square within, variance ratio.
- Blocking methods, matching, and randomized block designs
 - post-hoc blocking, predefined range blocking, predefined value blocking, sampled range blocking, sampled value blocking
- Analysis of covariance
 - adjusted mean square, adjusted sum of squares, adjusted treatment means, concomitant variable, covariate, slope-treatment interaction.
- Factorial designs
 - crossed treatments, factor level, interaction (disordinal, ordinal), main effect, nested treatments, ranked qualitative factor, sampled qualitative factors, simple effect.
- Other topics/concepts/designs (definition only)
 - attenuation, balance, high-order interaction, incomplete block, index of response, Latin-square design, missing value, Monte Carlo method, multivariate analysis of variance, multivariate statistics, orthogonal comparison, randomization test, repeated measures design, residual standard deviation, response curve, robustness, sequential method, standard Latin-square design, single subject design, split-plot, variance-covariance matrix.