* Quantitative research relies on the collection and analysis of numerical data to describe, explain, predict, or control variables of interest.
* Quantitative research focuses on objectivity that permits the researcher to generalize findings beyond a particular situation or setting.
* Approaches to conducting quantitative research include nonexperimental and experimental designs.
* Nonexperimental research designs comprise techniques where there is no manipulation of any variable in the study. These designs include descriptive research, correlational research, and causal-comparative research.
* Descriptive research focuses on describing and making interpretations about the current status of individuals and settings, and includes observational and survey research.
* In survey research, data are collected from a sample of respondents selected to represent the larger population.
  + There are multiple modes of delivering surveys, including direct administration, mail surveys, telephone surveys, interviews, e-mail surveys, and web-based surveys.
* While electronic surveys have their advantages, they also have numerous technological limitations.
* Three basic types of surveys are descriptive surveys, cross-sectional surveys, and longitudinal surveys.
* Three types of longitudinal surveys are trend surveys, panel surveys, and cohort studies.
* Cross-sectional surveys are the most commonly used survey design among educational researchers.
* In survey research, participants are selected so they represent a target population that the researcher wants to use to generalize the results of the study.
* Surveys should be accompanied by a cover letter, which explains the purpose of the study and describes what is required of participants.
* A strength of survey research is its collection of data from a large number of people. Limitations include potentially low response rates and the time and financial requirements of some modes of data collection.
* Correlational research is designed to discover and possibly measure the relationships between two or more variables.
  + Explanatory correlational studies seek to understand and describe related events, conditions, and behaviors.
  + Predictive correlational studies predict future conditions or behaviors in one variable from what is known about another variable.
* The basic design for correlational research involves a single group of people who are quantitatively measured on two or more variables that already happened.
* Relationships are measured by calculating a correlation coefficient, which indicates the direction and strength of the relationship.
* It is critical to remember that “correlation” is not equivalent to “causation.”
* Causal-comparative research focuses on exploring the reasons behind existing differences between two or more groups.
  + The presumed cause is the independent variable (also referred to as the grouping variable), and the variable of interest is the dependent variable.
  + Although causal-comparative research cannot explain true cause-and-effect relationships, it is a viable alternative when variables cannot be manipulated due to impracticality or ethics.
* In most quantitative research designs, it is desirable to have a minimum of 30 participants per group.
* The category of experimental research designs includes preexperimental designs, quasi-experimental designs, true experimental designs, and single-subject research designs.
* Generally speaking, all experimental research designs share commonalities, including participants who are randomly selected and/or randomly assigned to groups, an independent variable that can be manipulated by the researcher, and a common dependent variable that can be measured in all groups in the study.
* Random selection is the process of randomly choosing individuals to participate in a study so that every member of the population has an equal chance of being selected as a member of the sample.
* Random assignment is the process of randomly placing participants in treatment and comparison groups.
* When a study includes random selection *and*random assignment, the study is experimental research; if the study includes *only*random selection, the research is a quasi-experimental study.
* Single-variable designs involve only one manipulated independent variable; factorial designs involve two or more independent variables, at least one of which is manipulated.
* Preexperimental designs are weak and, if used, should be followed by a more stringent research study.
* Quasi-experimental designs come the closest to true experiments, but they still lack random assignment of participants to groups.
* True experimental designs control for nearly all extraneous threats to validity.
* Single-subject research designs are experimental-type studies conducted on individual participants.
* All types of quantitative research designs are subject to threats to validity.
* Internal validity is the degree to which measured differences on the dependent variable are a direct result of the manipulation of the independent variable and not some other, extraneous condition.
  + Threats to internal validity include history, maturation, differential selection of participants, testing effect, instrumentation, statistical regression, attrition, and selection-maturation interaction.
* External validity refers to the extent to which results of a particular study are generalizable to other groups or settings.
  + Threats to external validity include population, personological, and ecological validity.