



**SIMPLETENSE**

## **Research Design: Types, Methods, Instruments, Frames of Analysis**

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You’ve just picked up an order about research methods, but maybe you’re not sure where to begin. This simple research design guide will help you make choices that save time and meet the writing prompt requirements.

Briefly, research methods are the details about the research procedure—how (and why) data is collected, analyzed, and described (Creswell 3). This guide covers the three most common research designs (quantitative, qualitative, and mixed methods) and explains useful terms that you can use when writing.

## Guiding Questions

First, let’s consider three questions: 1) What is the proposed research about (e.g., social science or natural science issues)? 2) What is the researcher’s perspective or personal background (e.g., major of study)? 3) Who is the audience? (Creswell 23). For example, prompts related to psychology or business can be considered social science research projects because they tend to involve human subjects. The prompt will usually include information about the client’s program or major (e.g., marketing, economics, education, etc.) which also influences the type of research design that should be used. Using this information, the first step in the research methods process is to choose a research approach.

## Research Approach

With the above questions in mind, it’s time to choose a research approach. Most research is either quantitative (close-ended, measurable) or qualitative (open-ended, subjective), although mixed methods research (combining both approaches) has become more established in recent decades (Creswell 24). Note that more published studies use quantitative research approaches than qualitative ones (Kumar ch. 8). The following questions can help you decide which type of research approach to use:

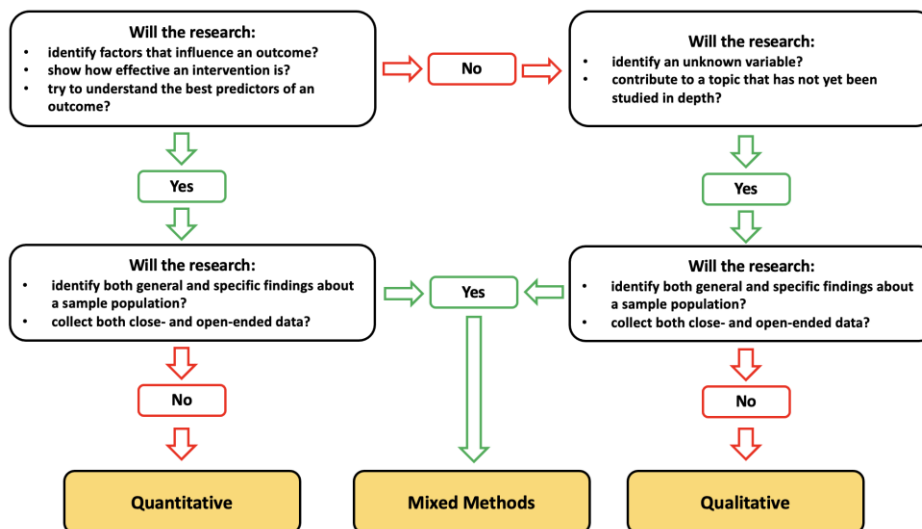


Fig. 1. Research Approaches Flow Chart.

Source: Adapted from Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 3rd ed., Sage, 1994, pp. 24.

## *Quantitative Research*

Quantitative research is better suited for *measuring* the extent of a phenomenon, rather than simply describing it. This research approach is usually used to test hypotheses about relationships between pre-defined variables (e.g., a curriculum and students' scores on a writing assignment) or the effectiveness of a new product, program, or treatment (McCombes para. 8). Critically, quantitative research designs should be defined well enough to be replicated. Common types of quantitative data collection are:

- Probability sampling
- Structured (close-ended) interviews
- Questionnaires or surveys

Findings usually describe averages and frequencies among variables as well as correlations between them (McCombes para. 8).

## *Qualitative Research*

Qualitative research revolves around the attitudes, beliefs, perceptions, feelings, and experiences of the people being studied (Kumar ch. 8). This research design is typically more flexible and informal than quantitative research. A major distinction of qualitative research is the relatively small power gap between researcher(s) and subject(s) (Kumar ch. 8). In contrast with quantitative research, qualitative research is more appropriate for *describing* diversity in social situations. Common types of qualitative data collection are:

- In-depth interviews
- Participant observation
- Oral history

Findings usually describe ideas, patterns, and concepts rather than measurable variables.

## *Mixed Methods Research*

Mixed methods research allows researchers to combine quantitative and qualitative approaches to collect a wider range of data and draw broader conclusions. For instance, many mixed methods research designs combine surveys (quantitative) with a smaller number of in-depth interviews (qualitative) with members of the same sample population. Note that mixed methods research usually takes longer than the other two approaches because both quantitative and qualitative data are collected and analyzed. However, mixed methods research is beneficial because it can be used to answer a research question in more ways than one and offer deeper insights than only one approach or the other.

## Research Design

Now that we have chosen a research approach, it's time to select a more specific research design. A helpful hint is to begin by thinking about the purpose of the study (Shamil para. 11),

before deciding whether the research is quantitative or qualitative in nature (or both). Common research purposes include:

- Reviewing existing research
- Explaining a cultural phenomenon
- Suggesting solutions to a major societal problem
- Creating a new system

### *Quantitative Research Designs*

Quantitative research designs can be described in terms of the number of contacts the researcher has with the study's subjects, the reference period of the study, or the nature of the research (Kumar ch. 8). In terms of contacts, there are three main types of research designs:

- **Cross-sectional:** One contact with the study's subjects
- **Pre-test/post-test:** Two contacts with the study's subjects
- **Longitudinal:** Three or more contacts with the study's subjects

By reference period, there are three types of research designs:

- **Retrospective:** Studies an event that happened in the past
- **Prospective:** Studies an event that the researcher manipulates
- **Retrospective-prospective:** Studies an event that started in the past and continues

In terms of the nature of the research, there are four common quantitative research designs: experimental, quasi-experimental, descriptive, and correlational. Each design has its own purpose, as shown below:

Type of design	Purpose/characteristics
Experimental	<ul style="list-style-type: none"> <li>• Tests causal relationships by changing an independent variable and measuring its effect on a dependent variable</li> <li>• Subjects randomly assigned to groups (experimental vs. control)</li> <li>• Conducted in a controlled environment</li> </ul>
Quasi-experimental	<ul style="list-style-type: none"> <li>• Tests causal relationships by changing an independent variable and measuring its effect on a dependent variable</li> <li>• No random assignment (researcher assigns groups)</li> <li>• Conducted in a natural (non-controlled) environment</li> </ul>
Descriptive	<ul style="list-style-type: none"> <li>• Describes trends, averages, characteristics, etc.</li> <li>• Variables measured without researcher's intervention</li> </ul>
Correlational	<ul style="list-style-type: none"> <li>• Tests whether (and how strongly) variables are linked</li> <li>• Variables measured without researcher's intervention</li> </ul>

Fig. 2. Types of Quantitative Research Designs

Source: McCombes, Shona. "Research Design: A Step-by-Step Guide with Examples." *Scribbr*, 7 June 2021, [www.scribbr.com/methodology/research-design/](http://www.scribbr.com/methodology/research-design/). Accessed 11 June 2022.

A quantitative research design should be selected after considering the research question and variables involved in the study. For example, if students being researched in a study are divided into two groups based on earlier test scores, the study would be using a quasi-experimental design. If the students were randomly assigned, however, the study would be experimental.

### Qualitative Research Designs

Qualitative designs are more flexible and follow fewer rules. The three most common types of qualitative designs are case studies, focus groups, and ethnographies, described below:

Type of design	Purpose/characteristics
Case Study	<ul style="list-style-type: none"> <li>• Studies a specific subject in detail (e.g., an event, place, organization)</li> <li>• Data collected with a range of methods and sources</li> <li>• Aims to understand the case holistically</li> </ul>
Focus Group	<ul style="list-style-type: none"> <li>• Studies interactions between members of a group</li> <li>• Data collected through participant observation</li> <li>• Aims to generate ideas, understand experiences, or gauge popular opinions</li> </ul>
Ethnography	<ul style="list-style-type: none"> <li>• Studies a specific group or culture in detail</li> <li>• Data collected through close observation and immersion</li> <li>• Aims to describe the group's beliefs, culture, and society</li> </ul>

Fig. 3. Types of Qualitative Research Designs

Source: McCombes, Shona. "Research Design: A Step-by-Step Guide with Examples." *Scribbr*, 7 June 2021, [www.scribbr.com/methodology/research-design/](http://www.scribbr.com/methodology/research-design/). Accessed 11 June 2022.

Breen's (2006) [article](#) is a particularly useful guide to focus group research. Other qualitative designs used to a lesser degree are grounded theory, which produces a new theory by systematically reviewing qualitative data, and phenomenology, which is the study of an event through its participants' own experiences.

### Research Problem

A clear research problem, or question, is one of the most important elements of any study. Ideally, the question includes information about the people or process involved (P), the intervention that will be evaluated (I), the unit or group being compared (C), and the outcome being studied (O) (Hastings and Fisher 9). In other words, the most effective research questions are "[PICO questions](#)." For example, "how can my curriculum help students develop their skills for effective research writing?" Another way to phrase this question is, "what is the effect of my curriculum on students' research writing skills?"

## Variables

All research involves independent and dependent variables. Although they sound autonomous, *independent* variables are usually manipulated by the researcher (e.g., a treatment) or they occur naturally and affect other variables (e.g., longer daylight hours in the Northern Hemisphere in the summer). Like their name suggests, *dependent* variables (e.g., a patient's status) change based on an independent variable. If you ever feel confused, remember that the independent variable affects the dependent variable.

## Control Groups vs. Experimental Groups

In both experimental and quasi-experimental (quantitative) studies, subjects are divided into control groups and experimental groups. The experimental group, or "treated" group, receives the researcher's treatment, program, or product (e.g., a new pharmaceutical drug in a medical trial). The control group, or "untreated" group, receives a placebo or substitute for the treatment, program, or product (Kenny 345). In both cases, only the researcher should know who is in the control group and who is in the experimental group, though they may or may not have been randomly assigned. Kenny's (1975) [article](#) explains the differences between the two groups in detail.

## Hypothesis

The hypothesis predicts what your research will find in a statement that includes the tested variables. Generally, a hypothesis is based on the study's research question and is formatted like an answer to the question. For example, if the question is "what is the effect of my curriculum on students' research writing skills?" a reasonable hypothesis would be "teaching my curriculum to students will lead to higher scores on their research writing assignments." A logical hypothesis is informed by the results of earlier studies, so it's helpful to do some research before proposing a hypothesis.

Most hypotheses are structured in one of three ways: 1) "If... then...," including a cause and effect, 2) they predict a "positive" or "negative" relationship between two variables, or 3) they describe an expected difference between two variables using "better...than" (McCombes para. 12).

In quantitative research, hypothesis testing is also common. If you are required to test the hypothesis, a null hypothesis must also be included after the main hypothesis. A null hypothesis is the argument that there is no relationship between the tested variables (McCombes para. 15). The hypothesis and null hypothesis are written in the following format:

$H_0$ : The new curriculum has no effect on students' scores.

$H_1$ : The new curriculum has a positive effect on students' scores.

## Research Instrument

A study's research instruments are used to collect data. Research instruments are often determined by the study's selected research design and can be modified to suit a specific study. As described, common types of quantitative data collection are close-ended questionnaires or

surveys, probability sampling, and structured interviews. Qualitative data collection tools may also include questionnaires and surveys, interview guides, participant worksheets, and/or ethnographic notetaking.

### *Questionnaires and Surveys*

Quantitative, close-ended questionnaires and surveys usually have a set number of questions and only collect data that can be numerically coded (e.g., age, years of education, degrees of agreement). Likert scale questions, yes or no questions, and other types of questions with a limited number of responses are commonly used. For example, “on a scale from 1 to 10, with 10 being the highest, how satisfied are you with this research guide?”

Qualitative questionnaires and surveys tend to be open-ended, rather than close-ended, and can include free answer responses in addition to sliding-scale responses. For example, “how did you feel after participating in the study?” and follow-up questions like, “why or why not?”

### *Interview Guides*

Another common type of research instrument is the interview guide. Like questionnaires, interview guides include a set of questions for study participants. Interview guides are designed to be delivered via direct interviews with participants, however, and tend to be more carefully structured.

## Data Collection

Data is collected through the research instrument. As described in the section above, research instruments can vary based on your chosen research design. This section of the research methods paper may also ask you to specify how long it will take to collect data and who will provide the data. It is important to describe the intended sample population, sampling method, and data collection period with a phrase such as, “Data will be sourced from *a minimum of 20 university students via random sampling over the course of two months.*” More details are better!

Common sampling methods include quota sampling, snowball sampling, and probability (random) sampling. Quota sampling involves recruiting a set number of participants who meet a specific criterion (i.e., race, gender, age). Snowball sampling is done by recruiting members of a participant’s broader network. Probability, or random, sampling involves recruiting participants via a raffle or another non-deliberate process that gives everyone an equal chance of being selected (Etikan and Bala 1-2). See Etikan & Bala (2017) for more details about types of sampling methods.

## Validity and Reliability

Validity measures how well the research instrument reflects the study’s research aims. Two questions to consider are: 1) Do the research instruments test every aspect of the research question? And 2) does the concept being researched correlate with other measures of the same concept? (McCombes para. 50). The second question is especially important to consider when ensuring that the variables being tested are indeed separate.

Reliability measures how consistent the elements of the research instrument are. All questions corresponding to one concept should be testing the same concept. In addition, the same concept should be measured consistently over time (McCombes para. 51). Reliable studies produce findings that should be easy to replicate if the study is repeated. In theory, both the reliability and validity of the research instruments should be checked before the study is conducted.

## Data Analysis

Data analysis methods refer to how raw collected data is analyzed to address the research problem. Data analysis methods vary by research design but always begin with data “cleaning” to remove errors, incomplete answers, and other data that could affect the overall accuracy of the study’s findings. Next, data is coded and analyzed.

### *Quantitative Data Analysis Methods*

Quantitative research designs typically have data analysis methods that code responses into numerical (quantitative) or categorical (quantitative or qualitative) data. This data is entered into a code book and analyzed for patterns, usually with the help of statistical software like SPSS.

**Data Analysis by Contacts.** Longitudinal research tracks trends over time and usually includes many data points for a smaller number of variables. Data analysis should focus on the averages and frequencies of, as well as correlations between, these data points. In contrast, pre-test/post-test studies may only have two data points for each tested variable, and cross-sectional studies may focus more on descriptive statistics.

**Data Analysis by Reference Period.** Like cross-sectional studies, retrospective studies may focus on describing a set of data that was collected at a given point in time. Prospective and retrospective-prospective studies may have more data points for a smaller number of variables.

### *Qualitative Data Analysis Methods*

In qualitative research, textual data is often coded into themes or patterns, focusing on specific words or phrases. In focus group, case study, and ethnographic research, the purpose of data analysis is often to establish trends among members of the group being studied, as well as highlight inconsistencies or outliers in the data. Data analysis should address why these trends emerged and identify similarities and differences in the participants’ responses.



## Works Cited

- Breen, Rosanna L. "A Practical Guide to Focus-Group Research." *Journal of Geography in Higher Education*, vol. 30, no. 3, 2006, pp. 463–475.
- Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 3rd ed., Sage, 1994.
- Etikan, Ilker, and Kabiru Bala. "Sampling and Sampling Methods." *Biometrics & Biostatistics International Journal*, vol. 5, no. 6, 2017, pp. 1–3.
- Hastings, Clare, and Cheryl A. Fisher. "Searching for Proof: Creating and Using an Actionable PICO Question." *Nursing Management*, vol. 45, no. 8, 2014, pp. 9–12.
- Kenny, David A. "A Quasi-Experimental Approach to Assessing Treatment Effects in the Nonequivalent Control Group Design." *Psychological Bulletin*, vol. 82, no. 3, 1975, pp. 345–362.
- Kumar, Ranjit. *Research Methodology: A Step-by-Step Guide for Beginners*. 3<sup>rd</sup> ed., Sage, 2011.
- McCombes, Shona. "How to Write a Strong Hypothesis: Steps & Examples." *Scribbr*, 6 May 2022, [www.scribbr.com/methodology/hypothesis/](http://www.scribbr.com/methodology/hypothesis/). Accessed 11 June 2022.
- McCombes, Shona. "Research Design: A Step-by-Step Guide with Examples." *Scribbr*, 7 June 2021, [www.scribbr.com/methodology/research-design/](http://www.scribbr.com/methodology/research-design/). Accessed 11 June 2022.
- Shamil, Fazal R. "What is Research? Research Methodology." *T4Tutorials*, 3 Mar. 2022, [t4tutorials.com/what-is-research-research-methodology/](http://t4tutorials.com/what-is-research-research-methodology/). Accessed 10 June 2022.