

# Quantitative and Qualitative Research and Philosophical Assumptions

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## Abstract

The purpose of this research note is to briefly describe the differences between quantitative and qualitative research approaches from philosophical viewpoints, namely ontological, epistemological, methodological, and axiological perspectives. Their differences in terms of methods are often discussed and well-known; however, their fundamental differences lie in their philosophical assumptions. In this paper, first, the definitions of quantitative and qualitative research are provided. Then each philosophical assumption is presented with its definition and how it is interpreted in quantitative and qualitative research. Each approach holds a distinct worldview that stems from ontological, epistemological, methodological, and axiological assumptions.

## Introduction

Qualitative research has gained attention as an alternative or as an addition to quantitative research because some quantitative researchers became aware of the limitations of the quantitative evidence (Creswell & Poth, 2018). As a result, the differences between quantitative and qualitative research and the advantages and disadvantages of each research have been discussed in many research methodology books and articles. The differences of research techniques, such as analyzing test scores in quantitative research and analyzing interviews in qualitative research, are often considered as the main differences between the two approaches. However, the fundamental differences lie in their philosophical assumptions, namely ontology, epistemology, methodology (Slevitch, 2011), and axiology.

Quantitative research “explains phenomena according to numerical data which are analyzed by means of mathematically-based methods, especially statistics” (Yilmaz, 2013, p. 311). Compared to qualitative research, quantitative research has well-established data collection and analysis

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methods. It investigates a phenomenon by testing a hypothesis that consists of measurable variables to determine if the hypothesis is supported or not. While some researchers have provided the definition of qualitative research, it is not as straightforward as quantitative research. Nevertheless, keywords included in the definition help understand this type of research. Yilmaz (2013) used the words, “inductive,” “interpretive,” and a “naturalistic” approach used to study people, cases, phenomena, social situations and processes “in their natural settings” to reveal “descriptive terms” for the meanings people give to their experiences in the world (p. 312). Denzin and Lincoln (2011) used the words “situated activity,” “series of representations,” and making sense of phenomena in the “terms of the meanings people bring to them” (p.3). These keywords point to the characteristics of qualitative research pertaining to data collection and analysis procedures: qualitative research seeks to gain insights of phenomena through “the collection of extensive data on many variables over an extended period of time, in a naturalistic setting” (Gay & Airasian, 2000, p. 627). Further, keywords such as “flexible” with “multiple interpretations or perspectives,” and that reality is not “static or fixed” (Yilmaz, 2013, p.317) indicate that there are differences in philosophical assumptions between qualitative and quantitative research.

### **Philosophical Assumptions**

According to Creswell and Poth (2018), “Whether we are aware of it or not, we always bring certain beliefs and philosophical assumptions to our research” (p. 15). They influence how a researcher seeks information to answer the questions and serve as basis of evaluation of a study. Creswell and Poth’s (2018) assertion underscores the importance of becoming aware of these assumptions as they shape the direction of research. Researchers formulate research questions, plan how the issue can be investigated, design research, and identify data collection and analysis methods. What follows is a brief explanation of four philosophical assumptions: ontology, epistemology, methodology, and axiology.

### **Ontology**

Ontology can be defined as the study of the nature of reality (Creswell & Poth, 2018; Yilmaz, 2013). It is concerned with the assumptions researchers make to believe something makes sense (Scotland, 2012). Quantitative research stems from positivism that assumes reality is single, tangible, and fragmentable (Needleman & Needleman, 1996; Yilmaz, 2013). It also contends that there is only one truth (Slevitch, 2011). On the other hand, qualitative research is based on interpretivism and constructivism and assumes that realities are multiple, socially constructed, and holistic (Creswell & Poth, 2018; Yilmaz, 2013). Reality is context-bound; therefore, it is continuously recreated by its participants based on their own understanding of it (Slevitch, 2011).

Ontology is crucial to understand how researchers make meaning of the data they gather. One's ontological belief determines how they develop research questions, understand their significance, and approach data analysis.

### **Epistemology**

Epistemology concerns with the nature and the scope of knowledge (Creswell & Poth, 2018; Slevitch, 2011). Simply put, it is concerned with how people come to know something and how people know the truth. It addresses the following questions: What counts as knowledge? How are knowledge claims justified? What is the relationship between the researcher and that being researched? (Creswell & Poth, 2018). Consequently, these questions lead to one question: how can researchers investigate whatever they believe to be known? (Slevitch, 2011). Quantitative research stems from positivism and assumes that there is an objective, rationally organized reality which is independent of researchers' perceptions as well as those who participate in research (Needleman & Needleman, 1996; Slevitch, 2011). Thus, quantitative research takes an etic view in epistemology where researchers are outsiders of what is being investigated. In other words, they cannot influence or be influenced by what is being investigated to find the truth that is objectively measured. Unlike quantitative research, qualitative research takes an emic view in epistemology where interactions between researchers and participants or what is being investigated are considered necessary to gain an in-depth understanding. In qualitative research, reality is mind-dependent and socially constructed; therefore, people can understand it only through their perceptions and interpretations (Slevitch, 2011). Epistemology is important as it affects how a researcher will engage in a study and uncover knowledge in the context that they will investigate.

### **Methodology**

Methodology has to do with philosophies that guide data gathering, and it determines methods. In quantitative research, researchers seek to develop a generalizable explanation about what is being investigated by using statistically measurable tools (Yilmaz, 2013), and their methodology is often described as experimental (Slevitch, 2011). They start with research questions and hypotheses, conduct interventions, and analyze the results in terms of either supporting or not supporting the hypotheses. They use reliability (i.e. consistency of a measure) and validity (i.e. the accuracy of a measure) to evaluate their research (Yilmaz, 2013) because it is important that research results are not influenced or biased by factors that are not identified in the hypotheses. This idea is reflected in the randomization sampling strategy which allows to construct a sample that can be an unbiased representation of the population (Needleman & Needleman, 1996). Further, given that objectivity and generalizability are the core principles, quantitative research entails statistical analysis and

uses methods such as experimental research, survey research, correlational research, and quasi-experimental research.

While quantitative research uses a deductive reasoning, qualitative research uses an inductive reasoning. Based on the epistemological premise that researchers can only provide their interpretations of what is being investigated, qualitative research seeks to understand a phenomenon through an in-depth description of it from researchers' and participants' perspectives (Yilmaz, 2013; Slevitch, 2011). Therefore, in qualitative research, the purposive sampling strategy is used: researchers select a sample that can provide rich information to understand the phenomenon. Unlike quantitative research, objectivity and generalizability are not the criteria to evaluate research. Instead, the concepts of credibility, transferability, dependability, and confirmability are used to assess qualitative studies (Yilmaz, 2013). According to Lincoln and Guba (1986), credibility is the confidence that the findings are true from the participants' viewpoint. Transferability is about the degree to which the findings can be transferred to other contexts. Dependability is similar to reliability in quantitative research. A study is dependable if the findings of a qualitative study is repeatable. Finally, confirmability is whether or not other researchers would confirm the findings.

Qualitative research aims to gain better understanding of a phenomenon from the participants' point of view and offer rich descriptions of the phenomenon (Guba & Lincoln, 1994). Its interpretive nature calls for data collection through interviews, observations, and participatory activities, for example. There are five different approaches that guide researchers to find the best way to address their research focus: narrative (i.e. exploring the life of an individual), phenomenological (i.e. understanding the essence of the experience), ground theory (i.e. developing a theory grounded in data from the field), ethnographic (i.e. describing and interpreting a culture-sharing group), and case study (i.e. developing an in-depth description and analysis of a case(s)) research (Creswell et al., 2007). These approaches mainly differ in the end product. For example, a narrative study will provide a detailed picture of an individual's stories, and a theory will emerge from a grounded theory study. In considering the methodology, researchers should ask themselves the question: What methodology and method will enable me to answer my research question?

## **Axiology**

Axiology has to do with the role of values in research. Quantitative research, which takes the positivist approach, makes a distinction between facts and values. Facts are viewed as objective truth whereas values are seen as subjective which can be inherently misleading and prevents the pursuit of truth (Given, 2008). The axiological assumption here is that objectivity is good, and subjectivity is bad. In contrast, the researcher reports their values and biases they bring to the study as well as the value-laden nature of data they gather in qualitative research (Creswell & Poth, 2018).

In practice, the researcher admits that reported stories reflect not only the voices of the participants but also the researcher themselves. Axiology is of particular importance because values take “pride of place” and are perceived as “ineluctable” in shaping the findings of qualitative research (Guba & Lincoln, 1994). Axiology considers what value researchers attribute to the different aspects of research such as participants, data, and audience. In other words, one’s axiological assumption can be inferred from the other three assumptions.

## Conclusion

The primal difference between quantitative and qualitative approaches lies in philosophical assumptions. The two approaches are developed from different ontological, epistemological, methodological, and axiological perspectives. One’s view on ontology dictates their epistemology which dictates their methodology. What the researcher wants to investigate and how to go about it emerge from their philosophical assumptions. Quantitative research allows researchers to test specific hypotheses and to obtain generalizable results, but it does not offer specific details about participants’ experiences (Yilmaz, 2013). Qualitative research, on the other hand, provides a depth and richness of information regarding participants’ feelings, thoughts, frame of references, experiences with their own words (Yilmaz, 2013). The downside is that findings may be influenced by researchers’ bias and personal subjectivity. While there are research studies that only use one research, quantitative and qualitative approaches can be used in combination to obtain a better understanding of complex problems and phenomena (Molina-Azorin, 2016).

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