

Basics and Characteristics of Quantitative Research in Social Sciences: A Brief Guide for Educational Research

Burcu Altun¹

Abstract

The human-nature conflict is a phenomenon that has been going on since the first day of human history. It can be said that humans have to make sense of nature in order to survive and improve their living standards. Throughout history, people have tried many different ways to make sense of nature and its phenomena. Through mythology, religion, metaphysics and ultimately science, human beings have constantly searched for the truth. He has made a conscious effort to understand and analyze himself, other people, and the phenomena and events around him, and has followed appropriate paths. In this study, after briefly mentioning the human search for truth and then the positivist approach to finding the truth, quantitative research, which is a reflection of the positivist approach, and its characteristics will be discussed. Basic quantitative research designs will be classified and the role of quantitative research in educational research will be examined. Finally, the concerns of quantitative research will be emphasized.

Keywords: Positivism, qualitative research, educational research, social sciences.

Article History:

Received: August 13, 2022

Accepted: September 20, 2022

Recommended Citation: Altun, B. (2022). Basics and characteristics of quantitative research in social sciences: A brief guide for educational research. *International Journal of Excellent Leadership (IJEL)*, 2 (2), 49-60.

¹ Assist. Prof. Dr., Aydin Adnan Menderes University, Faculty of Education, Aydin/Turkey, <u>burcu.altun@adu.edu.tr</u> ORCID: 0000-0002-8564-829X

International Journal of Excellent Leadership, 2022, 2 (2), 49-60. B. Altun

Introduction

Human beings have generally followed three ways to understand their environment and events. These are experience, reasoning, and research (Cohen, Manion & Morrison, 2007: 5). These are the ways people use to search for and reach the truth. Experience is what people have accumulated over a lifetime, it provides useful information in many situations, but it is a subjective way of problem solving. Reasoning is the second way people understand and make sense of the world. Reasoning started with Aristotle's deduction and continued with Bacon's induction. In the 1600s, Bacon criticized deduction on the grounds that it led to bias and instead proposed induction, which allowed conclusions to be drawn from a series of individual cases. Later, the inductive-deductive approach showed its influence. The third way that humans use to reach the truth is research. The main points that distinguish research from experience and reasoning are that it is systematic and controlled, empirical and self-correcting (Balci, 2011: 1-3). When did science say its first word about research? The first known scientific work is the work of Anaximander of Miletus, which he dealt with 547 years before Christ, but didn't he have guides? Thales, the merchant, sailor and scholar from Miletus. Thales' prediction of the time of the solar eclipse shows that he also had teachers, who are thought to have been the Babylonians. In seven plates made of clay, the Babylonians wrote about the stars, the planets, the year, the month, the day, the magnitude of the stars and the solar eclipse. Medical manuals, the first geographical maps were here... In zoology books, animals were classified and animals were divided into birds, fish and quadrupeds. Dogs, donkeys, oxen were subclasses of quadrupeds... They calculated the number π as approximately 3 (Ilin & Segal, 2009: 131-133). Classification, measurement and calculation were at the roots of science. Events and phenomena were observed, tested and transformed into certain numerical expressions.

In summary, the most primitive starting point of science is the collection and classification of experiences. Then comes the effort to express them numerically. Quantity is one of the important stages in the development of science (Kaptan, 1998: 11). The idea of "*Everything that exists has a certain amount. Knowing it in all its ways is possible by knowing the quantity as well as the quality* (Thorndike, 1918: 16), is a concrete example of the tradition of expressing scientific research with numbers. Seeing true knowledge as the product of quantification is the gift of positivism. In this context, the nature of quantitative research and positivism within it will be briefly examined.

Nature of Quantitative Research

For something to be considered knowledge, it must meet three basic conditions (Yıldırım, 1993: 13): (1) That it can be expressed with a proposition, (2) evidence and documents showing the truth of this proposition and (3) belief in the truth of a proposition.

In the search for scientific knowledge, one starts from a proposition and tries to support the truth of this proposition with certain evidence. Evidence is usually everything related to the phenomenon. What is important here is that the propositions are based on a theory. The nature of the quantitative approach requires starting from a theory and determining the conformity of the phenomenon under study to that theory. While testing the conformity of a phenomenon to a theory, the phenomenon is generally attempted to be described with all its features. This effort of description manifests itself with a positivist understanding in the form of the quantification of the phenomenon.

Positivism and the Positive Sciences

Science is the effort to understand the phenomena in our world through description, explanation and prediction. Positivism is to reach new generalizations and make new inferences by observing phenomena and examining the relationships between each individual phenomena. While positivism focused on natural sciences until the beginning of the 19th century, the sciences dealing with human beings were later included in the field of positivism (Aziz, 2013: 4).

Natural and Human Sciences: Natural sciences, such as physics, chemistry, biology, geology, physical anthropology, astronomy, etc., deal with living and non-living beings in the world and the events related to them, which constitute the subject matter of positive sciences (Aziz, 2013: 4). Just as positivist epistemology has been the pioneer and dominant approach in the development of

natural sciences, similarly, positivism has been the pioneer and dominant element in the historical development of social science. Positivism argues that the methods and techniques used in natural sciences can also be used in social sciences. According to this approach, there is only one logic that any activity that has the characteristics of science should follow. That is to examine phenomena by using experiments and observations, statistical and mathematical techniques, to establish relationships and to arrive at new generalizations based on them. The rationalization of the results obtained with philosophy is also provided. If the studies conducted by different researchers in the same population do not show consistency with each other, it means that mistakes have been made in measurement, method, technique or analysis and interpretation (İslamoğlu & Alnıaçık, 2013: 13).

The approach to social reality completely influences the approach to explaining and interpreting it. The approach therefore brings with it different truths about research methods and researcher roles. If the researcher adopts a positivist approach, he/she will look at social reality as concrete, real and external to him/her and adopt traditional research approaches (Balcı, 2011: 4) and quantify his/her observations through inductive and deductive ways of reasoning (Balnaves & Caputi, 2001: 39).

There are similarities and differences between the human and natural sciences within the positive sciences. Both deal with individual events and the relationships between them. The aim is to determine these relationships and to make inferences from them by obtaining precise or near-precise results and to generalize them. In addition, the inductive method is another similarity of both sets of sciences. On the other hand, the nature of the subjects they examine and the certainty of the results differ between these two sets of sciences (Aziz, 2013: 5).

Educational Sciences in Positivism: Today, scientific research in various fields of education is rapidly being put into practice. There are two views on the scientization of education today (Balcı, 2011: 3): I-Traditional view considers education as natural sciences and applies natural science research in producing science. II-The radical view maintains the traditional social science approach to natural science research and the description of human behavior. The emphasis is usually on human difference from natural phenomena and from each other. It is argued by many researchers that it is difficult to make generalizable inferences about educational research. Although there is a large part of education that can be explained with quantities, there are also cases where quantities are insufficient to explain events and phenomena.

Quantitative Research

Research is the search for truth and reality. Scientific research is the one conducted by following a certain systematic approach in data collection, analysis and interpretation (McMillan & Schumacher, 1984: 7). If social events are seen as the natural world, i.e. as concrete, external and objective reality (positivist paradigm), scientific research will be oriented towards the analysis of the relationships between events or variables in this world and will mainly involve experimentation and observation. Positivism, which forms the basis of quantitative research, has a number of characteristics that give rise to the search for quantitative data. The search for objective research methods, the tendency to explain causes with laws and the search for a standard language have brought along quantification. These points emphasized in positivism are summarized in Table 1 (Marvasti, 2004: 8).

Table 1

Points	Positivism
Theoretical position on social reality	How can we use objective research methods to capture the essence of social reality?
Objective of the research	What are the laws that explain the causes of human behavior?
Enduring question	How can we develop a standardized and neutral language for reporting research?

Points Emphasized in Positivism

Source: Adapted from "Qualitative research in sociology" by Marvasti, A. B. (2004). Sage Publications.

International Journal of Excellent Leadership, 2022, 2 (2), 49-60. B. Altun

Quantitative research is often conceptualized by its pioneers as follows: Quantitative research means having a logical structure in which researchers identify the problems they emphasize through hypotheses derived from general theories. In positivist methodology, researchers tend to test hypotheses derived from theory. These hypotheses are assumptions about causal relationships. Due to the belief that concepts in social sciences are abstract, the need to make operational definitions arises. Data are collected and analyzed through surveys, experiments and observations. In this way, the hypothesis is confirmed or falsified. The findings are absorbed by the theory that establishes the whole process in the first stage (Bryman, 1988: 18-19). These stages are summarized in Figure 1.

Figure 1

Logical Structure of the Quantitative Research Process



Source: Adapted from "Quantity and quality in social research" by Bryman, A. (1988). Routledge.

As can be seen, quantitative research starts from theory and arrives at theory. There are researchers who categorize quantitative research differently. For some researchers, quantitative research is empirical, while for others it falls under the category of statistical research. In the recent past, quantitative approaches were the dominant research approach in social science research. Today, it continues to be effective despite new paradigms (Newman & Benz, 1998: 5).

Characteristics of Quantitative Research

When we think of quantitative research, statistics and numbers often come to mind. Quantitative research is the process of explaining a phenomenon by collecting numerical data that allows for analysis using mathematically based methods. A step-by-step examination of the definition will be enlightening for understanding quantitative research (Muijs, 2004: 1-2):

The explanation of the phenomenon: The main concern of all research is to try to explain something.

Numerical data: In order to perform the analysis with mathematically based methods, the data must also be numerical.

Mathematical-based method: This refers to the method used to analyze data and is usually a statistical-based application.

Although quantitative research is directly identified with quantification by some researchers, it is an approach that includes many features. According to Creswell (2012: 13), the main features of quantitative research can be listed as follows:

- The identification of a problem through the need to explain the relationship between variables or through the explanation of trends,
- Providing a central role for the literature by suggesting research questions to ask, validating the research problem and creating the need to define a pathway,
- Formulating specific, concise, measurable and observable propositions, research questions and hypotheses,
- Collecting quantitative data from large numbers of people through instruments with prestructured questions and responses,
- Using statistical techniques; analyzing trends, comparing groups, or relating variables and interpreting results by comparing them with preliminary predictions and past research,
- Writing research reports with standardized, fixed structures and evaluation criteria and adopting an objective, unbiased attitude.

The quantitative research approach emphasizes certain things at different stages of the scientific process. The assumptions that quantitative research focuses on at particular steps of the process are summarized by Johnson and Christensen (2004: 31). Table 2 outlines the whole process in the quantitative research approach.

Table 2

~	
Scientific Method	Deductive or "top-down". The researcher tests the hypothesis or theory with data.
View of human behavior	Behavior is regular and predictable.
Most common aims	Describe, explain, and predict.
Focus	Narrow-angle lens; testing a specific hypothesis.
Nature of observation	An attempt to study behavior under controlled conditions.
Nature of reality	Objective (different observers agree on what is observed).
Data format	Quantitative data collection through structured and validated data collection instruments.
Nature of data	Variables.
Data analysis	Identifying statistical relationships.
Results	Generalizable results.
Report format	Statistical report (relationships, comparisons, significance)

Whole Process in the Quantitative Research Approach

Source: Adapted from "*Educational Research, Quantitative, Qualitative and Mixed Approaches*" by Johnson, B. & Christensen, L. (2004). Pearson Education, Inc.

As can be seen, quantitative research uses deduction as a scientific method, the hypothesis is tested with data. Human behavior is assumed to be regular and predictable and the aim is to describe, explain and predict these behaviors and phenomena. Reality is considered "objective" and the validity and reliability of data collection tools are emphasized. Data is collected on variables and analyzed by identifying statistical relationships. At the end of this process, the important thing is to reach generalizable findings and these results are presented in the light of statistical evaluations.

In addition to these, Michael (1999: 11-13) emphasized the approaches taken in the quantitative research process according to research effectiveness. Random sampling, questionnaires and scales, numerical values, validity, reliability, statistics and empiricism are presented as concepts identified with quantitative research. These activities and approaches are given below:

- Selection of subjects or units of analysis: Random sampling to ensure generalization and allow statistical comparisons,
- *Research protocol:* Data collection, usually through structured questionnaires and scales, and the widespread use of closed-ended, choice-presented questions,

- *Data collection and recording methods:* Basically numerical values and observation checklists with clearly defined categories,
- *Data triangulation:* Consistency checklists are included in questionnaires to ensure independent measurement of key variables,
- Data analysis: Descriptive statistics, multiple variance analysis, significance tests
- The role of the conceptual framework: To serve as a source of empirically testable hypotheses
- *Research activity:* Starting from the general, focus on the result rather than the process, positivist approach.

The Meaning and Place of Quantification in the Quantitative Research

The main purpose of all fields of science can be summarized as knowing the relevant population and trying to solve problems by making new discoveries in related fields. Within the framework of these and similar purposes, many scientific researches are carried out in every field, every century (Alpar, 2012: 11). For social sciences, research can be defined as a multifaceted activity that seeks to understand human behavior and increase knowledge on this subject. (Büyüköztürk et al., 2013: 2). Measurement is an important element in this activity.

Measurement is the process of observation and recording (Erdoğan, 2012: 242). "Let alone saying that much progress can be achieved in any branch of science without resorting to measurement, it is hardly a defensible claim that there can be a kind of science without measurement ..." (Yıldırım, 1993: 87). Measurement is an integral element of science. Science and the development of science has been possible through measurement and the ability to make better and more precise measurements. As science progresses, the importance given to measurement and mathematical operations increases (Kaptan, 1998: 11).

If you can measure what you are talking about and express it numerically ... it means that you know something ... if you cannot, your knowledge is both insufficient and not of the desired quality; what you know may be the beginning of knowledge, but whatever the case ... it cannot be said that you have reached the scientific stage at the level of thought (Yıldırım, 1974: 129; cited in Yıldırım, 1993: 87).

Measurement is important for science because the benefits of measurement to science are tangible. Science ensures that its results are expressed as precisely, clearly and accurately as possible. The data obtained through measurement makes this possible. When the expression "water boils when heated" and the expressions "water boils when the water temperature is increased to 100 degrees" are compared, the first statement falls short in terms of precision and clarity and the amount of information they provide. Converting qualitative concepts into quantitative concepts is an important problem in all branches of science. In fact, the state of development of sciences is measured by the degree to which concepts are quantitative (Yıldırım, 1993: 87).

The emphasis of quantitative research on measurement comes from the measurability of events and phenomena in natural sciences. When it comes to social sciences, of course, there is a need for measurement and numbers, but care should be taken when associating them with facts. Social sciences are based on empirical research. Empirical findings are findings from observed events. Empirical research requires measurement. These measurement results or measurements can be expressed as data (Büyüköztürk et al. 2013: 2). Statistics comes into play in the process of making measurements and making these measurements meaningful.

Johnson and Christensen (2004) argue that statistics is a science that deals with the collection, classification, presentation and interpretation of numerical data. Statistics brings together and examines measurable information and enables the development and application of methods and techniques for making sense of this information and obtaining reliable results from the resulting information (Aziz, 2013: 14). The science of statistics is an indispensable part of research processes and is the common point of all branches of science. It enables planning the study, collecting and

evaluating data, reaching a decision and making inferences in order to examine any subject scientifically (Alpar, 2012: 12).

Obviously, science cannot be abstracted from numbers and quantification, but as emphasized before, the main source of quantification is essentially the concern to describe the phenomenon. When describing the phenomenon, it is extremely important to know as many features as possible in order to understand and make sense of it. On the other hand, in order for numbers to make sense in a research, the research needs to be designed appropriately. In the next section, the main quantitative research designs will be discussed.

Quantitative Research Designs

Quantitative designs include experimental designs, pretest-posttest designs and many other designs. The aim is to reach generalizations through valid and reliable measurements, random selection and control of variables (Newman & Benz, 1998: 5-20). Scales and experiments are the main tools of quantitative research, but three other tools should be emphasized. The first one is the analysis of previously collected data. For example, official records on crime, unemployment, health, suicide can be included in the quantitative research tradition. Secondly, structured observations are an important source of quantitative data. The observer makes observations within a predetermined program and quantifies the results. Finally, content analysis (e.g. qualitative analysis of the communication content of the media) also has many of the characteristics of quantitative research (Bryman, 1988: 12) when you describe the content with numbers. These three approaches are underemphasized under the quantitative research approach in many sources.

Research can be classified in different ways in terms of the way the subject is handled, method, content and purpose (İslamoğlu & Alnıaçık, 2013: 39). In addition to these, it is also possible to classify quantitative research according to the level of knowledge, comparisons, and examination of change over time (Erdoğan, 2012: 169-199). In this section, some of Erdoğan's (2012: 169-199) classifications will be used when classifying quantitative design types. Erdoğan (2012: 169-199) categorized quantitative research designs as exploratory, descriptive and correlational research according to the level of knowledge; comparisons of variables and groups according to comparisons; development research, cross-sectional research, longitudinal research and repeated measures according to the method of finding change over time; and experimental designs and other.

Types of Research by Level of Knowledge

According to the level of knowledge, research types can be classified as exploratory research designs, descriptive survey research and correlational designs.

Exploratory Research Design: This research design is intended to understand what is happening, to find and identify the unknown, and to develop control mechanisms. Usually one of the experimental research approaches is used. This type of research is important in finding the unknown and pioneering the next. Exploratory experiments in science are examples of this research design (Erdoğan, 2012: 169). For instance, Cuthill (2002) investigated local development practices as demonstrated by the experiences and deeds of local citizens, community-based organizations, and local government by exploratory research design.

Survey Designs: In some quantitative research, it may not be desirable to test an activity or material or to determine the relationship between variables. Instead, the researcher may want to determine the trends of a large population. Survey research attempts to determine the trends, attitudes, opinions and characteristics of a large group of people by applying a scale or questionnaire to a small group of people (Creswell, 2012: 21). Survey models are research approaches that aim to describe a situation existing in the past or present as it is (Karasar, 2012: 77). They produce quantitative information about the social world and describe the views of people or the social world (Kuş, 2012: 44). Survey research, which is widely conducted in social sciences in education, seeks to describe phenomena and events by taking the opinions of individuals about a phenomenon or event (Scott & Morrison, 2007: 232; Lodico et al. 2006: 157) and are highly valid studies. For example Altun (2014) searched the views of teachers and administrators in terms of their preferences about teacher

International Journal of Excellent Leadership, 2022, 2 (2), 49-60. B. Altun

supervision as a tool for professional development by survey design. As a result of survey research participants wanted teacher supervision to be executed by multiple actors (Altun and Sarpkaya, 2020).

In summary, survey research is research that aims to collect data to describe certain characteristics of a group (Büyüköztürk et al. 2013: 14). The concept of description means depicting what a situation, condition, person, relationship, organized activity, communication process, applied policy is (Erdoğan, 2012: 169). Generally, no hypothesis is identified, no relationship is sought, no prediction is made; the nature of the variables is described. The aim is to describe the existing situation (Karakaya, 2011: 59). Based on the theory, it is extremely necessary in developing the theory, creating a theory and making suggestions about the situation (Creemers et al. 2010: 111).

Relational Designs: In some studies, the researcher cannot intervene in the group or assign individuals to the group. In such cases, the relationship or interaction of one or more variables is examined using statistical methods and correlation. The level of this relationship, which is determined numerically, expresses the relationship between two or more variables or whether one can predict the other (Creswell, 2012: 21). If the design seeks a relationship between two variables, it is called bivariate analysis, and if it seeks common effects and relationships with multiple variables, it is called multivariate analysis. If a cause and effect relational design. The cause is an activity, while the effect is what comes with that activity. In social sciences, the difficulty of controlling everything else that affects a variable and the possibility of finding spurious relationship patterns as significant without realizing it are important limitations of the design (Erdoğan, 2012: 171-172). Demir (2023) explored the relationship between teachers' professional autonomy and motivation and Bayraktar (2023) investigated relationship between school administrators' self-efficacy and political skills by relational designs.

Research on Finding Change Over Time

Development Research Design: The nature of change in the phenomenon selected for research is examined as a function of time. The design can be a single time series, a trend analysis, a growth design intended to compare groups. For the simplest example, a child who is curious about how much his/her height grows by putting a notch on the door makes measurements for a development analysis on the basis of his/her height (Erdoğan, 2012: 176). Issues such as economic growth and socio-economic development can be analyzed as a function of time.

Longitudinal Design: In longitudinal studies, a single or a group of elements are taken into consideration and their changes in terms of the phenomenon being searched are monitored in parallel with time (Kaptan, 1998: 68). It is conducted to examine the situation or change within a specified period of time and is based on systematic data collected over a period of time (Erdoğan, 2012: 178). In short, it involves collecting multiple data from the selected sample at different times (Karakaya, 2011: 61). For example, examining a group of seven-year-old children over a period of years until they are eight, nine and ten years old in terms of the specified variable is the method of longitudinal design (Kaptan, 1998: 68). For instance, Kartal and Beşer (2023) designed a longitudinal study on primary school students' reasons for liking and disliking children's books and collected data through two years from the same students.

Cross-Sectional Design: Cross-sectional design may also be referred to as latitudinal or extended design in some sources. It means conducting a developmental analysis in a single time period. For example, the change in consumption habits of children as they grow up can be the subject of design (Erdoğan, 2012: 178); however, instead of following a group of children for years, the habits of children from different age groups can be analyzed, comparisons can be made and changes can be interpreted. For example Saraç et al. (2023) assessed Turkish primary school teachers' responses to dental injuries, particularly dental avulsions by a cross sectional design.

Experimental Design: Some quantitative researchers investigate whether an educational intervention produces changes for individuals. Experimental designs are well suited to this type of research problem. Experimental designs, sometimes referred to as intervention designs or group comparisons, seek to determine whether an activity or material produces changes in outcomes for

individuals. In this research, the effect is measured by holding one group constant while providing some activities to another group (Creswell, 2012: 20-21). Experimental research is defined by some researchers as research in which the most precise results are obtained among scientific methods. With this approach, for example, a teacher in a geography course can collect data on the application of several methods and compare their effects on the level of learning while looking for ways to effectively teach a concept to students (Büyüköztürk, et al. 2013: 17). The main features of this research design are to directly show the effect of variables on each other and to enable the testing of hypotheses (Karakaya, 2011: 75). For example Atatekin, Istanbullu and Korkmaz (2023) investigated the effect of using digital stories in Turkish lesson on students' achievement and attitudes by experimental design.

Meta-Analysis

Meta-analysis is a method used to reach a synthesis from the results of these studies by considering and examining the research conducted for a specific purpose or subject together. As a result of meta-analysis studies, results with high generalizability and verifiability are reached by evaluating many researches' results. In meta-analysis, the analysis of different research findings is usually done using statistical techniques. With this method, it is also aimed to overcome the limitations of single research (Büyüköztürk et al. 2013: 18). Meta-analysis is a systematic review study and with such studies, it is aimed both to help draw the big picture by evaluating the results of primary studies and to provide decision makers and practitioners with results based on more reliable scientific data (Üstün & Eryılmaz, 2012).

Quantitative research designs offer researchers the opportunity to address the relevant phenomenon in the most accurate way. Quantitative research is very valuable in terms of providing concrete data in describing the phenomenon. It is extremely important in terms of enabling valid and reliable measurements, aiming for generalizability with random selections, and being the basic starting point in explaining theories. In addition, quantitative research has some weaknesses. The next section briefly addresses these concerns.

Concerns of the Quantitative Research

Although quantitative research is a common type of research, it is possible to say that it raises a number of concerns. Bryman (1988: 21-41) examined these concerns in detail. Also Queirós, Faria and Almeida (2017) evaluates strengths and limitations of quantitative research methods. These concerns can be summarized under the following headings:

Concepts and the measurement of concepts: Concepts are the main focus and starting point for the social sciences. Quantitative research has to make concepts observable, which is a challenging issue. These concepts are rooted in hypotheses derived from a theoretical framework. Conceptualization in social sciences is a difficult task. At this point, operational definitions are given while conceptualizing. Then we move from these concepts to empirical indexes and ways of measuring the concepts are determined. The wide use of factor analysis exemplifies this point. Factor analysis attempts to describe the dimensions underlying the items of a particular scale. A simple example of this approach can be seen in the Ohio State studies. Definitions of leadership were presented to subordinates and leadership behavior was measured.

Causality: Quantitative research is heavily preoccupied with establishing causal relationships between concepts. This has emerged under the influence of the natural sciences. The emergence and frequent use of the concepts of dependent and independent variables is a product of the tendency that there should be causal reasoning. In descriptive research, data are collected by means of questionnaires, interview forms, etc. from a sample. The data provide the researcher with the opportunity to see whether there is a relationship between various variables given in the questionnaire. The researcher tends to establish a cause and effect relationship, but since "correlation does not imply cause", the success of establishing causality is limited. Experimental designs are more prone to establish causal relationships.

Generalization: One of the biggest concerns of quantitative research is generalization. This is most evident in sample selection. The main reason for random selection is to strengthen the possibility of generalizability, but ensuring generalizability is not an ordinary task.

Replicability: Replication is a means of checking the degree of applicability of findings to other contexts. It is also seen as a means of checking the biases of the researcher. This is actually a gift of the natural sciences, but reproducibility is difficult in the social sciences.

Individualism: Quantitative research tends to see the individual as the focus of empirical research. It reflects the overall measurement of the sample through the sum of individual responses. Individuals do not need to know each other, only the sum of their independent responses is attributed to the sample. Also reliability of data is very dependent on the quality of answers of individuals.

Being aware of the concerns of quantitative research can lead to its more effective use. In particular, educational research has an important place in the subject areas of quantitative research. An educational researcher should know how to utilize quantitative research in accordance with its starting point and purpose. In the next section, the place of quantitative research in educational research approaches will be examined.

Conclusion

Since the first day of the history of science, humanity has been in pursuit of accurate and useful knowledge. It owes its success in its struggle with nature to scientific research. Its success in this struggle is directly proportional to its success in analyzing events and phenomena. The approach it uses to analyze events and phenomena is extremely important. The basic starting point for making inferences about a phenomenon is to describe the phenomenon in the best way practicable. In order to test the accuracy of a piece of knowledge, after a proposition is developed, all the features related to that proposition are put forward. These features will be compared with the existing theory and then accepted or rejected according to their conformity. The effort to present a proposition with all its features as much as possible in order to be able to make comparisons has led to the quantitative definition of the phenomenon. This is the starting point of quantitative research. The phenomenon is attempted to be described with all relevant quantities.

The quantitative scientific approach has many characteristics. The quantitative approach is concerned with generalization of facts and events. The results obtained from a certain sample are attempted to be generalized to the universe. For this, systematic selections are made and the numerical data obtained are analyzed in a systematic order. Again, a systematic reporting process is in question. The quantitative research approach, which is fed by the applications of positivism in natural sciences, has an important place in social sciences research. However, it also has some limitations. Choosing the right research design is important to minimize these limitations.

In addition, the place of educational research in social sciences research is quite important. The researcher's perspective on education will affect his/her approach to examining and explaining the events and phenomena related to education. The researcher will benefit from quantitative research approaches to a certain extent according to his/her perspective. The important thing is to be mindful when examining and making inferences about the phenomenon of education and to be robust in order not to be tempted by numbers and not to make false connections.

References

Alpar, R. (2012). Uygulamalı istatistik ve geçerlik-güvenirlik. Detay Publication.

Atatekin, D., Istanbullu, A., & Korkmaz, Ö. (2023). Türkçe dersinde dijital hikâye kullanımının öğrencilerin başarısına ve tutumlarına etkisi. *Trakya Eğitim Dergisi*, *13*(2), 1314-1341.

Aziz, A. (2013). Sosyal bilimlerde araştırma yöntemleri ve teknikleri. Nobel Publication.

Balcı, A. (2011). Sosyal bilimlerde araştırma, yöntem, teknik ve ilkeler. Pegem Akademi Publication.

Balnaves, M. & Caputi, P. (2001). Introduction to quantitative research methods. Sage Publications.

- Bayraktar, F. (2023). Okul yöneticilerinin özyeterlikleri ile politik becerileri arasındaki ilişki. *Recep Tayyip Erdoğan Üniversitesi Sosyal Bilimler Dergisi*, 10(1), 125-143.
- Brayman, A. (1988). Quantity and quality in social research. Routledge.
- Büyüköztürk, Ş., Kılıç Ç. E., Akgün, Ö., E., Karadeniz, Ş. & Demirel, F. (2013). *Bilimsel araştırma yöntemleri*. Pegem Publication.
- Cohen, L., Manion, L. & Morrison, K. (2007). Research methods in education. Routledge.
- Creemers, B. P. M., Kyriakides, L. & Sammons P. (2010). *Methodological advances in educational effectiveness research*. Routledge.
- Creswell, J. W. (2012). *Educational research planning, conducting and evaluating quantitative and qualitative research.* Pearson Education, Inc.
- Cuthill, M. (2002). Exploratory research: citizen participation, local government and sustainable development in Australia. *Sustainable development*, *10*(2), 79-89.
- Demir, O. (2023). Öğretmenlerin mesleki özerklikleri ile mesleki motivasyonları arasındaki ilişkinin incelenmesi. *Eğitim ve Bilim*, 48(213), 231-254.
- Erdoğan, İ. (2012). Pozitivist metodoloji ve ötesi. Erk Publication.
- Ilin, M. & Segal, E. (2009). *İnsan nasıl insan oldu?* (Trans. A. Zekerya). Say Publication.
- İslamoğlu, A. H. & Alnıaçık, Ü. (2013). Sosyal bilimlerde araştırma yöntemleri. Beta Publication.
- Johnson, B. & Christensen, L. (2004). *Educational research, quantitative, qualitative and mixed approaches.* Pearson Education, Inc.
- Kaptan, S. (1998). Bilimsel araştırma ve istatistik teknikleri. Tekışık Web Ofset Publication.
- Karakaya, İ. (2011). Bilimsel araştırma yöntemleri. (A. Tanrıöğen Eds.). In *Bilimsel araştırma yöntemleri* (pp. 55-84). Anı Publication.
- Karasar, N. (2012). Bilimsel araştırma yöntemleri. Nobel Publication.
- Kartal, H., & Beşer, R. (2023). İlkokul öğrencilerinin çocuk kitaplarını sevme ve sevmeme nedenleri üzerine boylamsal bir araştırma. *Okuma Yazma Eğitimi Araştırmaları*, 11(1), 1-24.
- Kuş, E. (2012). Nicel-nitel araştırma teknikleri. Anı Publication.
- Lodico, M. G., Spaulding, D. T. & Voegtle, K. H. (2006). *Methods in educational research from theory to practice*. Jossey-Bass.
- Marvasti, A. B. (2004). Qualitative research in socialogy. Sage Publications.
- McMillan, J. H. & Schumacher, S. (2006). Research in education. Pearson Education, Inc.
- Michael, B. (1999). Integrating quantitative and qualitative research. The World Bank.
- Muijs, D. (2004). Doing quantitative research in education with SPSS. Sage Publications.

- Newman, I. & Benz, R. C. (1998). *Qualitative-quantitative research methodology: Exploring the interactive continuum*. Board of Trustees.
- Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European journal of education studies*, *3*(9), 369-387.
- Saraç, F., Baş, A., Çelikel, P., Şengül, F., & Şimşek Derelioğlu, S. (2023). Türkiye genelindeki ilköğretim öğretmenlerinin diş yaralanmaları hakkındaki bilgi düzeylerinin değerlendirilmesi: Kesitsel Çalışma. *Turkiye Klinikleri Journal of Dental Sciences*, 29(2), 286-293.
- Scott, D. & Morrison, M. (2007). Key ideas in educational research. Continuum.
- Thorndike, E. L. (1918). The nature, purposes, and general methods of measurements of educational products. (Whipple Ed.). In *The seventeenth yearbook of the national society for study of education. part ii. the measurement of educational products* (pp. 16). Public School Publishing Co.
- Üstün, U. & Eryılmaz, A. (2012). Meta- analiz nedir? Nasıl yapılır? Fen ve matematik eğitimine ne tür katkılar sağlayabilir?. *X. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*. Niğde University, Niğde.
- Yıldırım, C. (1993). Bilim felsefesi. Remzi Publication.