



Quantitative Research in Education

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ABSTRACT

This paper is therefore designed to discuss Quantitative research in Education. The paper highlighted the Concepts and Characteristics of Quantitative Research, Steps in Quantitative Research Design, Variables in Quantitative Research, Quantitative Research Design. The paper also examines the Advantages and Disadvantages of Quantitative Research. The study establishes that quantitative research deals with quantifying and analyzing variables to get results. It involves the utilization and analysis of numerical data using specific statistical techniques to answer questions like who, how much, what, where, when, how many, and how.

INTRODUCTION

To fully comprehend quantitative research, it is important to provide a general overview of the research. Various academics and researchers from various fields have proposed various definitions of what constitutes research. Etymologically, the word research is derived from the French word "recherchē" which means to travel through or to survey. From the English perspective, the word research is formed by adding the prefix "Re" to the word Search. The word search on its own refers to a process of finding out about something or an event. A methodical and planned endeavor to look into a particular issue and offer a solution is called research (Mohajan, 2020). Thus, research deals with the search for knowledge. Since research deals with academic activity, it is pertinent to define it more technically. Saunders, Lewis, and Thornhill (2003) define research as "...something that people undertake to find out new things in a systematic way, thereby increasing their knowledge..." Kothari, (2004) describes research as "a scientific and systematic search for pertinent information on a specific topic". Research also involves creativity that is carried out

systematically to improve knowledge which consists of human knowledge, culture, and society, (OECD 2002).

Like in other academic disciplines, education research is a methodical and structured attempt to look into a particular issue to offer a solution. Its objectives are to advance knowledge, formulate theories, and compile data to support generalizations (Sekaran, 2000). Research in education can be classified into three basic categories quantitative research, 2) qualitative research, and 3) mixed method research (Swanson & Holton, 2005; Kothari, 2008; Creswell, 2011), This paper is therefore designed to discuss Quantitative research in Education. For the sake of clarity and easy understanding of the paper, the paper is discussed under the following subheadings:

- ❖ Concept and Characteristics of Quantitative Research
- ❖ Steps in Conducting Quantitative Research
- ❖ Types of Quantitative Research in Education
- ❖ Variables in Quantitative Research in Education
- ❖ Quantitative Research Designs in Education
- ❖ Advantages of Quantitative Research in Education
- ❖ Disadvantages of Quantitative Research in Education

Concept and Characteristics of Quantitative Research

The term "quantitative" refers to the quantity or amounts of data that are gathered during the research process, expressed in quantified or numerical forms, and backed up by statistical data (White & Millar, 2014). To generate and refine knowledge for problem-solving, quantitative research is viewed as a formal, objective, rigorous, deductive approach and systematic strategies (Burns & Grove, 2005). In a similar vein, quantitative research is defined as follows: it "employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data" (Creswell 2003; Williams, 2011). On their part, Leedy & Ormrod (2001) and Williams, (2011) reiterated that quantitative research involves the collection of data so that information can be quantified and subjected to statistical treatment to support or refute a hypothesis or answer a

given question. According to Aliaga and Gunderson (2002), quantitative research is those researches that involve collecting numerical data and using mathematical techniques to analyze the data to explain a problem or phenomenon. Original research that uses quantitative methods includes selecting a topic to study, formulating focused questions, gathering quantifiable data from participants, using statistics to analyze the data, and conducting the investigation impartially and objectively (Creswell, 2011). Brink & Wood (1998) and Burns & Grove (2005) stated that the following are the main characteristics of quantitative research:

1. In quantitative research, all aspects of the study are carefully designed before data are collected
2. In quantitative research data are collected in the form of numbers and statistics, often arranged in tables, charts, figures, percentages, or other non-textual forms. A numerical output is easy to read and understand, and deduce a meaningful conclusion than a detailed result.
3. In quantitative research the data are usually collected using structured research modern instruments, such as questionnaires or computer software are used to collect numerical data.
4. In quantitative research Statistical analysis is conducted to reduce and organize data, determine significant relationships, and identify differences or similarities within and between different categories of data.
5. In quantitative research Measurable population characteristics (e.g., age, number of children, educational attainment, economic status, etc.) are solicited by the data collection instruments used.
6. The results of quantitative research are derived from larger, population-representative sample sizes.
7. Quantitative Research is typically brief.
8. Qualitative research gives a precise description of the traits of specific people, circumstances, or groups.
9. Quantitative research emphasizes the procedures of comparing groups or relating factors about individuals or groups in experiments, correlational studies, and surveys.

10. Quantitative research Standardized, pre-tested instruments guide data collection to ensure accuracy, quite reliability as participants of the research face close-ended questions and high validity of data for repeated research study.
11. In Quantitative research, the outcome of quantitative research is easy to understand and explain.

Steps in Conducting Quantitative Research

According to Swanson & Holton, (2005) and Kumar, (2011), the quantitative research process generally consists of five major steps namely:

1. Formulating a research problem
2. Determining the human participants (population) in the study.
3. Selecting methods to be used to answer questions, identifies variables, measures, and the research design to use in formulating specific research questions, methods, and participants of the study (Warfield, 2013).
4. Selecting the statistical method of analysis for analyzing the collected data.
5. Interpretation of the results of the analysis based on the statistical significance determined

Variables in Quantitative Research

In educational research, the term "variable" is commonly employed to mean anything that can assume multiple values is a variable. According to Fraser Health Authority (2011), a variable is a quality and quantity-varying attribute of objects or people. "A property that assumes different values is called a variable." It also makes sense to group these qualities (Kerlinger, 1973). A person's age, gender, qualification, grade, scores, and other characteristics are examples of attributes that characterize an object or a human being. According to Wong (2014), a variable in quantitative research is a factor that can be altered or controlled during an experiment. Quantitative research involves measuring and evaluating variables to produce conclusions.

There are two types of quantitative variables: discrete and continuous variables.

- a. **Discrete variables:** Discrete variables are variables that exist only in units or whole numbers and not the fractional or decimal value e.g. 30 boys, 25 girls, 10 books, 15 pencils, 40 students, 24 Americans, 100 Nigerians, 100 Naira or 100 Dollars etc
- b. **Continuous variables:** Continuous variables are variables for which fractional value exists and have meaning e.g. 20.5 KM, 32.85 k. g, 13.9 Liters, and 4.51 CGPA.

Quantitative Research Design

A research design is the 'procedure for collecting, analyzing, interpreting and reporting data in research studies' (Creswell & Plano Clark 2007). It is the overall plan for connecting the conceptual research problems with the pertinent (and achievable) empirical research. In other words, the research design sets the procedure for the required data, the methods to be applied to collect and analyze this data, and how all of this is going to answer the research question (Grey, 2014). Several designs are employed in quantitative research, according to Sukamolson (2007) this can be classified as 1) survey research, 2) correlational research, 3) experimental research, and 4) causal-comparative research"

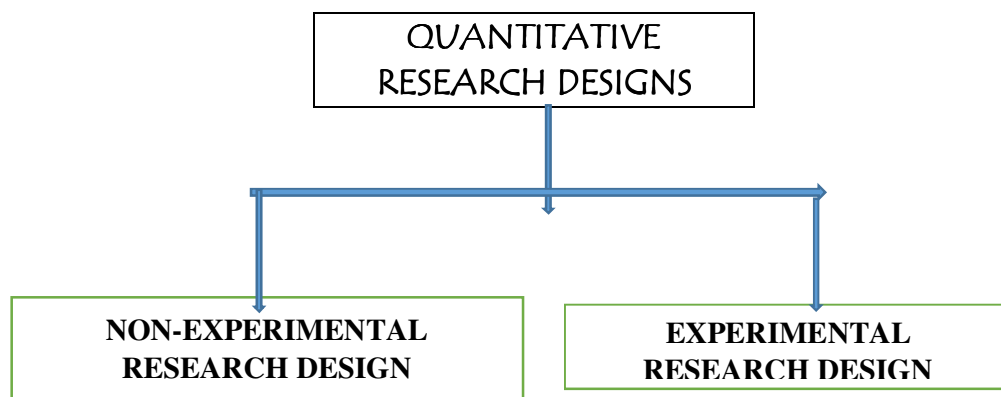


Figure 1: Quantitative Research Design

Experimental Research Design: During the experimental research, the researcher investigates the treatment of an intervention in the study group and then measures the outcomes of the treatment. There are three types of experimental research designs: pre-experimental, truly experimental, and quasi-experimental (Leedy & Ormrod, 2001).

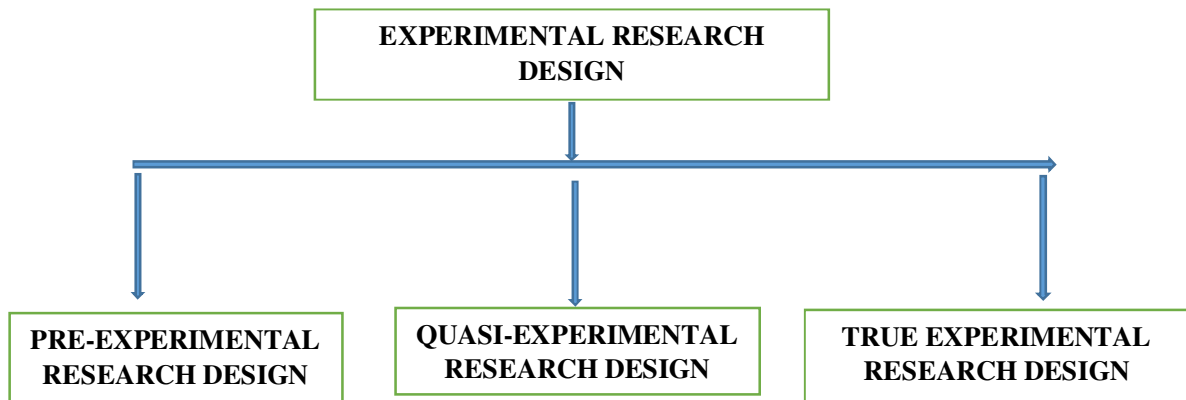


Figure 1: Experimental Research Design

Non-Experimental Research Design: is research that lacks the manipulation of an independent variable. Rather than manipulating an independent variable, researchers conducting non-experimental research simply measure variables as they naturally occur (in the lab or real world), Non-experimental research falls into three broad categories:

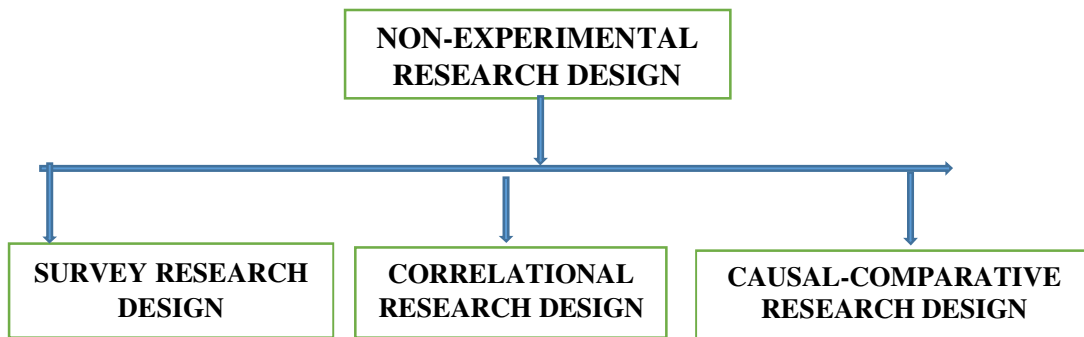


Figure 1: Non-Experimental Research Design

- i. **Survey Research Design:** according to Bostley (2019) Survey research design provides a numeric description of attitudes,

opinions, or trends of a population by studying a sample of the population. Survey research according to Sukamolson, (2007) is a form of quantitative research that encompasses the use of a scientific sampling method with a designed questionnaire to measure a given population's characteristics through the utilization of statistical methods. Kraemer (1991) outlines three basic tenets in survey research, namely, the survey is used to describe quantitatively a sectional aspect of a given population which involves studying the relationship,

- ii. **Correlational Research Design:** Correlational Research Design is a quantitative methodology used to determine whether, and to what degree, a relationship exists between two or more variables within a population (or a sample). The degree of relationships is expressed by correlation coefficients. Coefficients range from +1.00 to -1.00. Higher correlations (coefficients closer to +1.00 or -1.00) indicate stronger relationships. Leedy & Ormrod (2010) remark that the correlation method of research deals with creating a relationship between two or more variables in the same population. According to Marczyk *et al.* (2005) Correlation research design attempts to find relationships between the characteristics of the respondents and their reported behaviors and opinions.
- iii. **Causal-Comparative or Ex-Post Facto Research Design:** Ex-post facto research design implies "from after the fact" (Gay, 1976). In simple terms, in ex-post facto research, the researcher investigates a problem by studying the variables in retrospect Causal-comparative or ex-post facto research design is a non-experimental research design where the researcher compares two groups or more. Based on the cause (which is the independent variable) that has already occurred (Creswell, 2014).

Advantages of Quantitative Research

Some advantages of quantitative research according to Walker, (2005), Atieno, (2009), and Choy (2014) are as follows:

1. Data from quantitative research are relatively easy to analyze.

2. In quantitative research Data can be very consistent, precise, and reliable
3. In quantitative research Results from sample surveys can be generalized for entire populations
4. In quantitative research, there is transferability of the dataset to other analysts' which means that analysis is not dependent on the availability of an individual.
5. Quantitative research Findings can be generalized if the selection process is well-designed and the sample is representative of the study population.
6. Quantitative research is appropriate for situations where systematic, standardized comparisons are needed.
7. Quantitative research Results can be aggregated and are comparable across population groups.
8. Quantitative research Results can be broken down by socioeconomic group for comparison.

Disadvantages of Quantitative Research

Even though quantitative research is strong enough, it is obvious that it has some disadvantages which according to Walker, (2005), Atieno, (2009), and Choy (2014) include:

1. In quantitative research, Enumerators may give false data.
2. In quantitative research, poorly trained enumerators can make mistakes and inadvertently influence responses.
3. Large amounts of the dataset are never used if the project is very expensive.
4. Quantitative research in quantitative research commonly under-reports difficult issues, such as domestic violence and difficult-to-access individuals and households.
5. Quantitative research May give a false impression of homogeneity in a sample.
6. Quantitative research neglects intra-household processes and outcomes.
7. Quantitative research provides useful data by placing households or events in discrete categories.

8. Quantitative research sacrifices potentially useful information through the process of aggregation.

CONCLUSION

Quantitative education research was examined in this paper. According to the paper, quantitative research involves measuring and evaluating variables to produce conclusions. Using and analyzing numerical data is part of it. It can alternatively be defined as a way to gather numerical data to explain a problem or phenomenon. The investigation additionally discloses that there are two types of quantitative research: experimental and non-experimental. Analysis was also done on the benefits and drawbacks of quantitative research.

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