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Use of Mathematics in Quantitative Research

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Abstract: The purpose of this study is to find out the relationship between quantitative

research and mathematics. This is the literature reviewed article. I studied and reviewed different books, journals and articles for preparing this article. I found; without mathematics it is not possible to conduct the quantitative research. Quantitative research creates meaning through objectively uncover in the collected data. Quantitative research is good at providing information in large number of units rather than qualitative research. Similarly, Quantitative research is more reliable because of considering statistical method and it takes five big words like: theoretical, empirical, and nomothetic probabilistic, and causal.

Key Keywords: *Quantitative, Positivism, Mathematics, Numerical data*

Introduction

Research that uses numerical data that is analyzed using a mathematically based method, particularly statistics, is referred to as quantitative research (Muijs, 2004). Quantitative research places a strong emphasis on measuring and analyzing the causal links between discrete variables within a framework that is a priori theory-based, logical, reductionist, and deterministic. Utilizing a pre-made, standardized instrument is a requirement for quantitative research methodologies. Researchers often need large, randomly chosen representative samples in order to generalize their results from the sample.

Sets of beliefs serve as a guide for research and inquiry. A paradigm is a group of beliefs and worldviews. A fundamental set of beliefs known as a paradigm is built on ontological, epistemological, and methodological presuppositions. Different ideas

about the nature of reality (ontology) and knowledge reflect the many worldviews and paradigms that underlie quantitative and qualitative techniques (epistemology). Positivism, post positivism, experimental realism, and pragmatism-based quantitative research. The main tools utilized in quantitative research are a single existing reality and objective information.

Characteristics of Quantitative Research

Describe a research problem through the description of trends or the need for an explanation of the relationship between variables, giving the literature a significant role by suggesting the research questions to be asked and justifying the research problem, are some of the major characteristics of quantitative research, according to Creswell (2012). Establishing a need for direction; formulating explicit, focused, quantifiable, and observable purpose statements, research questions, and hypotheses; obtaining numerical data from a wide population utilizing tools that include questions and answers already existing; collecting inquiries and responses, gathering, gathering, gathering, analyzing, and interpreting the findings by contrasting them with previous hypotheses and research; utilizing standardized formats, evaluation standards, and a methodical, impartial approach when creating the research report.

Advantages of quantitative research

There are many different ways to perform quantitative research. Descriptive research employs survey research as well as correlational, developmental, and observational investigations. Experimental and causal comparative research may also use some of these study techniques. The positivist paradigm of measuring variables is to be the foundation of quantitative research, yet this paradigm excludes the common meanings of social phenomena (Denzin & Lincoln 1998). With a lot of different units, quantitative research is good at giving comprehensive information. The outcomes from quantitative research are frequently generalizable because of the large sample sizes

Suitable for circumstances in which systematic, standardized comparisons are necessary. When examining cause and effect, quantitative methods do better. The testing of theories and hypotheses is well suited for it. Since the outcome is typically numerical (quantifiable), it is regarded as being more "objective." For grants and bids, it can offer a distinct, measurable measurement. Because it uses five broad words—

theoretical, empirical, nomothetic, probabilistic, and causal—and takes into account the statistical technique, quantitative research is more trustworthy.

Since quantitative research involves a bigger, randomly chosen sample, its results are more likely to be extrapolated to the entire population or a specific subgroup (Carr, 1994). In addition to sampling, data processing takes less time since it employs statistical software like Connolly's (2007).

When do we use quantitative method? There are four types of research questions for which quantitative research is particularly well suited: the first is when we want a quantitative answer. How many students choose to study mathematics? Or how many mathematics teachers do we need? It is obvious that we need to use quantitative research to answer this kind of question. Muijs (2004, p. 7). Quantitative methods are also required to accurately study numerical change. Are the numbers of students at our university rising or falling? As well as wanting to find out about the state of something, we often want to explain phenomena. What factors are related to changes in student achievement over time? The final activity for which quantitative research is especially suited is testing hypotheses (Muijs, 2004; p. 7), such as the fact that there is no significant difference in math achievement between boys and girls.

Methodology

I applied a document analysis method to conduct this study. I analyzed different journal, books, and published papers of different use of mathematics on quantitative research. I made more comprehensive in terms of given literature. I described reading numerous earlier articles papers, and books about how mathematics might be used in quantitative research. The analysis of the literature makes clear that statistics and mathematics are essential to quantitative research.

Use of Quantitative Research in Mathematics

Around 1250 A.D., quantitative research began to take off as a result of the requirement for academics to quantify data. Since that time, quantitative research has dominated western culture as a means of generating new knowledge and meaning. An approach to research design that uses numbers or statistics is known as a quantitative research method. According to Leedy and Ormrod (2001), because it expands on preexisting theories, quantitative research is specific in the experiments and surveys it conducts. The approach of quantitative research upholds the empiricist paradigm's underlying

premise (Creswell, 2003). The researcher is separate from the study. As a result, reality is measured objectively using data. The objectively discovered patterns in the data that are collected are what give quantitative research its meaning. A problem statement serves as the starting point for quantitative research, which also includes the creation of a hypothesis, a review of the literature, and the analysis of quantitative data. Using experimental and survey approaches, quantitative research "collects data on preset instruments that provide statistical data," according to Creswell (2003 p. 18). Quantitative research can produce results that are prescriptive, explicative, and confirmatory. Relational questions concerning the research's variables can be answered via quantitative research. Researchers that use quantitative methods aim for explanations and forecasts that will affect other individuals and locations. The goal is to create generalizations that advance theory and to construct, conform to, and validate relationships (Leedy & Ormrod, 2001).

Positivists support a quantitative approach to determining the truths or causes of social occurrences, paying little attention to the subjective states of individuals. Thus, positivist philosophy presupposes that social sciences research methodologies can be utilized similarly to those used in the natural sciences (Panta, 2012). Such study relies on quantitative data, which can be examined or presented using tables or charts of figures, histograms, graphs, or statistics. Quantitative data is in numerical form. The techniques of quantitative research employed in mathematics and statistics include measures of central tendency, measure of dispersion, skewness, kurtosis, correlation, and regression, analysis of time series, index number, t-test, z-test, chi-square test, ANOVA, ANCOVA, and F-test. When answering "quantities"-related questions, quantitative methods are preferred (Panta, 2012). In other words, they are recording or quantifying phenomena or experiences. Thus, based on testable and verifiable facts, the social sciences may produce a clear, well-founded explanation and interpretation of social processes. Specific, well-organized, validated, and recognizable quantitative study designs have undergone reliability and validity testing (Kumar, 2014).

There are several definitions that can be given to the word "mathematics." It is a precise science that is concerned with measurements, calculating, finding connections, and solving space-related issues. In a strict sense, mathematics is the abstract science that analyzes deductively the implications latent in the fundamental conception of spatial

and numerical relations, according to the new English lexicon. The science of reasoning is another name for mathematics.

Math is a technique to establish the habit of reasoning in the mind. In mathematics, there are two different styles of reasoning: inductive reasoning and deductive reasoning. Because of this, a deductive strategy can be used to draw the conclusion from quantitative research. Similar to how pure reasoning incorporates systematic and deductive reasoning, pure mathematics deals with precise statements and concepts that are founded on perception. Since mathematics is the study of patterns that have been abstracted from the physical world, it has countless practical applications in the fields of the arts, sciences, finance, health, and recreation (Ruth Lawrence, cited in DfEE, 1999a: 15). Nobody has to be concerned that just applied mathematics will be used. You use mathematics every time you see your credit card or computer today, even the most obscure mathematics that we were promised would never be employed (Ruth Lawrence, cited in DfEE, 1999a: 15).

Because it has expanded both qualitative and quantitative kinds of learning, mathematics has profoundly helped modern civilization. Despite the fact that different people have different opinions about mathematics, quantitative research is employed to assess its instructional usefulness. What advantages does math have? What function does mathematics serve in contemporary life? The great instructional and researchable values that mathematics has to provide contribute significantly to realizing the purpose of education.

The primary goal of mathematics is to help each student grow into a contributing member of society (Kumar, 2011). In both quantitative research and everyday life, mathematics is used in a wide variety of practical ways. Everyone uses mathematics in some capacity, regardless of the class to which they belong in society. A worker changes his budget with the aid of mathematics and uses his knowledge of the subject to calculate wages for purchases at the market. We all employ a variety of mathematical concepts every day, including addition, subtraction, counting, numeral measurements, etc. A businessman runs his company effectively by using his understanding of percentages, average stock, and shares. Not only them Engineer, Doctor, administrators use Mathematical knowledge in the field of quantitative research (Kumar, 2011).

Conclusion

Utilizing the quantitative research method, more accurate and trustworthy information can be obtained. Given that mathematics always deals with facts, it is the ideal approach to use. Quantitative research and mathematics are closely related. The quantitative research method requires mathematical analysis, and it is also the most efficient approach for conducting mathematical research. From the aforementioned, it can be seen that quantitative research offers knowledge and expertise in quantitative methods for a variety of social and educational study discipline. Quantitative research takes the reader on a tour through the positivist and post-positivist paradigms-era quantitative tools used in the social sciences and education. Additionally, quantitative research helps mathematically rigorous instruments and approaches work properly while tackling research difficulties.

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