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RESEARCH PAPER

A Critical Review of Educational Research Methodologies: Approaches, Applications, and Implications

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ABSTRACT

This paper presents a comprehensive critique of educational research methodologies and methods, highlighting their philosophical foundations, practical applications, strengths, and limitations. It systematically examines the three major research paradigms—qualitative, quantitative, and mixed methods used in context of education. The paper explores the interpretive and critical approaches in qualitative research, experimental and observational techniques in quantitative studies, and various mixed methods designs such as concurrent triangulation and sequential approaches. Through critical evaluation, the study emphasizes the importance of aligning research questions with appropriate methodologies and discusses the ethical and epistemological considerations vital to educational research. The discussion also highlights the necessity of methodological literacy and ethical rigor for researchers, advocating for deliberate, well-informed design choices that enhance the credibility and applicability of educational research. Ultimately, the paper offers a balanced perspective on methodological pluralism and encourages thoughtful integration of diverse methods to address complex educational questions.

KEYWORDS Research Methodologies, Qualitative Methods, Quantitative Methods, Mixed Methods, Ethical Considerations, Methodological Critique, Research Design

Introduction

Rising Research is creative and systematic labor undertaken to build the store of information, including an understanding of persons, culture, and society, and leveraging this stock of knowledge to create new applications which corroborate facts, reconfirm the previous findings, address fresh or current problems, provides evidence for theorems, or produce fresh ideas (Kumar, 2005).

Scope of Educational Research

Research could be considered a systematic effort to better understand the educational process, usually with the goal of increasing its effectiveness, is referred to as educational research. With the progressive advancement of information and technology, the scope of educational research may vary (Mohajan, 2018). Thus, it might be necessary for educational research to broaden its scope for individuals and institutions. The procedures of investigation, planning, gathering, processing, and analyzing data, as well as their interpretation and inference-making, are all included in educational research. It includes topics related to formal education and conventional education (Kerlinger, 1986). In education research, an important step is to decide on the design once the theme has been chosen. The plan or framework for doing the research is called the research design. It serves as the guideline for the gathering, measuring, and analysis of data. The researcher seeks clarification on what, where, when, how much, and how it will be done questions (Chawla & Sodhi, 2011).

Importance of Methodology in Research Design

Research methods are regarded as part of the research process when they are incorporated into a larger scheme or design. This is commonly referred to as methodology, and it serves as the underlying principle of educational research (Mohajan, 2018). To complete their work, researchers in the subject of education must be knowledgeable about a variety of research methodologies. The structure of the design may change for the qualitative (context, nature of data, holistic approach, selection of participants, and inductive data processing) and quantitative (hypothesis, variables involved, and constraints) variables depending on the sort of study being done. The methodology and method that should be used will typically be determined by the research that has been done (Kumar, 2018). For instance, questionnaires and experiments are typically used in quantitative research, whereas interviews and observations are regularly used in qualitative research (Kumar, 2005). The main research designs are fundamental, applied, exploratory, and action research.

Researchers use an approach that depends on asking particular questions and adjusting factors to collect data regarding the teaching and learning process. The study topic under investigation will frequently dictate whether a particular methodology is viable. All educational research needs to abide by a predetermined set of ethical guidelines in order to protect the participants' rights and keep the study's credibility. No matter what method or approach is employed in the research, this is true (Chawla and Sodhi, 2011). Also, understanding the processes involved in conducting research can give education researchers the joy of picking up a fresh perspective that they can use to evaluate their daily experiences. As a result, it empowers the researcher to decide wisely about issues that arise in real life at various periods in time (Pandey and Pandey, 2021).

The goal of this review is to offer a critique of research methodology and techniques used in the field of education. The following sections of the study will go over the various research techniques utilized in education research. It will then assess each methodology's advantages and disadvantages and offer criticism of the approaches. The paper will conclude with a discussion of research methodologies in education.

Overview of Research Methodologies

Research methodology is an inclusive term and covers the characteristics of the population, sample design, sampling methods, data collecting, and data analysis. Numerous different methods and strategies are applied in the study of education. The three types of research methodologies that are most frequently utilized are qualitative, quantitative, and mixed. Research that is descriptive, evaluative, or assessment-based includes quantitative approaches (Mohajan, 2018). Analyzing the connections between naturally occurring variables is the focus of descriptive research projects. Studies that examine something include surveys, polls of the general population, evaluations of academic performance, and follow-up studies are examples of qualitative studies (Kumar, 2005).

In addition to these quantitative techniques, the studies in which events are to be understood and described through the eyes of the study participants are usually qualitative research. Case studies, grounded theory, ethnography, phenomenology, ethnomethodology, narrative research, and symbolic interaction are examples of qualitative research methodologies. The research questions are what, where, and how. As a result, the researcher must thoroughly justify and explain the use of the study

methodologies they used. Mix- methodology research design is the mixture of qualitative and quantitative data, and it aims to gain a deeper understanding of the topic being studied (Creswell, 2003). The research approaches most frequently used in educational contexts include surveys, interviews, focus groups, observations, and case studies. Surveys are a common way to obtain data from lots of respondents. Interviews are a fantastic way to learn knowledge from a certain group. Focus groups can be used to gather data from a group of people. Observations can be used to gather data by keeping an eye on people and the behavior they display. Using case studies, researchers might collect data from a single subject or a small number of subjects.

As stated above, each research technique, methodology, and plans have unique benefits and drawbacks, so the choice of effective methodology and method depends on the specific research question being answered as well as the resources that are available.

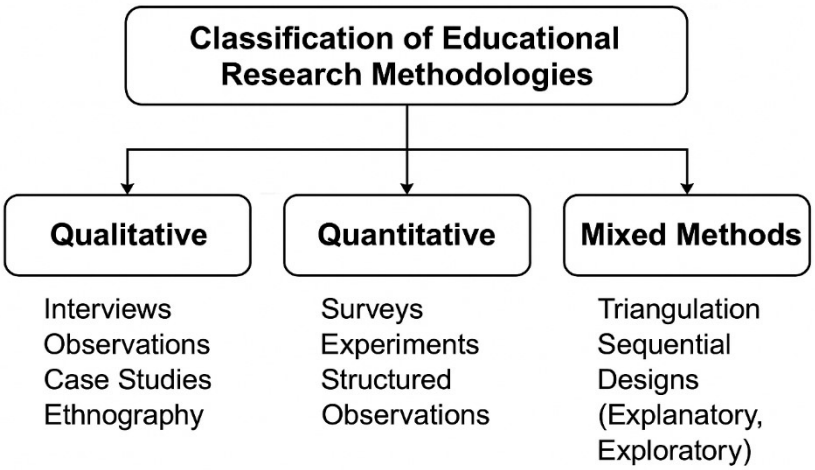

Figure 1. Classification of Research Methodologies

Qualitative Research Methodology

Characteristics and Philosophical Assumptions

In qualitative methodologies, an inductive technique is widely used by researchers that specialize in which they first observing a phenomenon before developing a theory or hypothesis in light of their results. This methodology is especially well suited to educational research since it helps researchers to fully appreciate the topic or issue being studied (Creswell, 1998).

Interpretive vs. Critical Approaches

There are two main categories that can be applied to qualitative research approaches: interpretive and critical research procedures. Using an interpretive lens, research methodologies attempt to understand a phenomenon from the perspective of persons who have firsthand experience with it. Research such as this one is very often employed to study educational phenomena, for example, students' perceptions of their learning or their classroom experiences. Critical research methods direct their main focus towards transforming existing power structures and inequalities , as stated by Bozalek & Zembylas (2017 and cited in Mohajan, 2018). Educational research involving this method is regularly used to study educational issues such as socioeconomic class and racial inequities.

Data Collection Techniques

Qualitative research methodologies are appropriate for different types of study topics. Particularly suitable for qualitative research, the interpretive methods are inquiries, which try to understand a phenomenon from the perspective of those who experience the phenomenon (Fig. 1). Participant observation, focus groups, and interviews are the kinds of studies that are often used in these kinds of studies (Mohajan, 2018). Interpretive research is commonly utilized as an investigative technique when investigating educational issues, for example, how students perceive learning or how they perceive the classroom instruction.

Strengths and Limitations

Interpretive methods have the advantage of allowing researchers to get a deep understanding of a particular phenomenon. This type of research often generates a lot of rich and detailed data, for example, it can be used to observe the inner feelings and thoughts of students that are not visible in their actions (Sahu and Singh, 2016).

One of the advantages of these qualitative methodologies is that they are able to be applied to studies of phenomena which are difficult to access or to see directly. For instance, critical techniques may be used to investigate students' inner feelings and thoughts. This also helps one to become more conscious of social injustice and unfairness, a benefit (Scandura and Williams, 2000). One of its drawbacks is that critical procedures typically rely on the researcher's individual interpretations and biases.

A natural setting or an observed natural event must be carefully observed and evaluated as part of the qualitative research method of scientific inquiry. An inductive technique is widely used by researchers that specialize in qualitative methodologies, in which they first observe a phenomenon before developing a theory or hypothesis in light of their results (Observational studies can be used to analyze behavior, but they are subject to bias if the researcher is not cautious (Sahu and Singh, 2016).

Quantitative Research Methodology

Key Characteristics and Research Design

Qualitative research method uses the approach which is based on scientific rationale and outcome (Yue and Xu, 2019). There are multiple ways that can be used to collect data for quantitative research (Figure 1). Surveys, experiments, and observational studies are a few of the quantitative methods that are most frequently used in educational research. A survey is one type of research technique, and its main objective is information gathering by questioning a group of people. In order to learn more about a population's opinions, beliefs, and actions, surveys are routinely utilized. Another research strategy involves conducting experiments. Experiments are commonly used in the investigation of the relationships between causes and consequences. A type of research known as an observational study entail documenting one's observations of people or occurrences (Brooman & Darwent, 2014). Surveys, a type of study, frequently include questions on people's opinions, views, or habits. Online, over the phone, or in person are all options for distributing surveys. One way to conduct research is through experiments, which include changing one or more variables to observe how they affect others (Fink, 2003). Tests of cause-and-effect correlations using experiments are common. Research methods known as observational studies entail watching individuals or events and then analyzing

the data that is gathered. There are two types of observational studies: structural and unstructured (Yue and Xu, 2019).

Strengths and Limitations

There are benefits and drawbacks to each of these quantitative research methods. For example, surveys are frequently used to gather information about people's perspectives. However, they do not help in investigating the phenomenal causes of any research hypothesis (Asika, 1991). Additionally, setting them up is expensive and time consuming. Quantitative methods are used in numerous situations, such as the gathering of data and the analysis of results (Brooman & Darwent, 2014). Nevertheless, the selection of the research strategy to be adopted must be based on the problem of study and the resources that are available at that moment.

Mixed Methods Research

Definition and Evolution in Educational Research

Mixed methods research is a relatively new way of undertaking research, and is usually guided by answering particular questions using both quantitative and qualitative data. Scholars in education are increasingly interested in this kind of research, which is emerging as a major strategy of the type as the process in classrooms and schools are complex. While the history of mixed methods research may be traced back to the field of social science, mixed methods research is being used more frequently in education research over the past few years. Tashakkori and Teddlie (2003) suggest that education is complex and as such it is difficult to understand completely using a single type of data. It is often considered that combining qualitative and quantitative research methods is a good way to get the best of both worlds. Although qualitative research is traditionally supposed to depict a more complete and more complex view of the world than does quantitative research (Johnson and Onwuegbuzie, 2004), qualitative research is ultimately thought to do so as well. Mixed methods research is regarded as a useful strategy to combine these two points of view to get a more thorough understanding of the topic under study (Tashakkori and Teddlie, 2003).

Design Types

There are various ways to do research that combines many approaches, namely 'Concurrent Triangulation', 'Sequential Explanatory', and 'Sequential Exploratory' which follow different data collection procedures (Figure 2). The most commonly used approach is to use a concurrent triangulation design, which is simultaneously collecting quantitative and qualitative data. This is the most frequent strategy. Another technique that is often used is sequential design which means that first quantitative data is obtained and then qualitative data. This is a common tactic (Snyder, 2019**).**

Table 1
Mixed Methods Research Design Models

Design Type	Description
Concurrent Triangulation	Both qualitative and quantitative data collected simultaneously.
Sequential Explanatory	Quantitative data collected first, followed by qualitative.
Sequential Exploratory	Qualitative data collected first, followed by quantitative.

Strengths and Challenges

Research using different approaches has numerous advantages. For instance, it allows researchers to examine some phenomena from different points of view. This may lead to the development of a more thorough understanding of the phenomenon (Tashakkori and Teddlie, 2003). Also, it can use combining qualitative and quantitative approaches in research to overcome the disadvantages of both the methodologies. Therefore, mixed methods research can be a useful technique to overcome these limitations as it offers a more complete view of the topic under study (Chawla and Sodhi, 2011).

Yet there are also some disadvantages that need to be taken into account. For instance, research that utilizes qualitative and quantitative approaches can be a time and resource expensive as well as expensive. It is because it often involves the use of advanced data analysis tools and requires the utilization of several data sources. Research using a number of approaches may also yield more complex and difficult to communicate results (Johnson and Onwuegbuzie, 2004).

Comparative Analysis and Evaluation

Over the past ten years, discussion of the nature of education research has centered on how to achieve the twin goals of being both theoretically and methodologically sound and using quantitative, qualitative, and mixed methods to address practical issues in education (Wilson, 2010). The methodology employed is qualitative and quantitative and the research procedure is different (see Figure 3).

Table 2

Comparison of Qualitative and Quantitative Reseach

Aspect	Qualitative	Quantitative
Data Type	Non-numeric (Text, Audio, Images)	Numeric (Counts, Measures)
Approach	Inductive	Deductive
Purpose	Explore meanings, experiences	Test hypotheses, measure variables
Tools	Interviews, Observations	Surveys, Experiments

Qualitative Research Methodology

In comparison of their quantitative counterparts, qualitative research methodologies offer a number of advantages that are unmatched. Starting off, using qualitative research techniques allows for data collection in a naturalistic setting, which can produce a more accurate depiction of the topic under study (Sahu & Singh, 2016). Secondly, unstructured data is often used in qualitative approaches because it provides more in depth analysis. For example, interviews and observations are two types of this kind of information (Scandura & Williams, 2000). It can also help in understanding the details of the data and finding the factors that might be influencing the event under study. Sometimes smaller scale studies are performed with qualitative approaches which can be less expensive and require less time and resource than big scale quantitative research. While qualitative research has its advantages, it should be noted that it also has

its disadvantages (Sahu and Singh, 2016). Qualitative methods are time consuming and labor intensive, and in general require a lot of knowledge and previous experience to be successfully applied. Furthermore, qualitative data are difficult to comprehend and also to assess qualitative data requires time and effort, and it isn't easy to extrapolate the qualitative research to the larger population (Mohajan, 2018).

On the other hand, qualitative research techniques also have a lot of common criticisms, which include too much subjectivity, no data output and no replication, as one of them. However, these critiques can be overcome by methodically planning and doing qualitative research initiatives (Sahu and Singh, 2016). Qualitative research approach is based on subjectivity because its goal is to understand the participants' views and experiences. Nevertheless, this subjectivity may be seen as a disadvantage because it can be difficult to tell whether the data is accurate and representative of the community (Scandura and Williams, 2000). If your study is intended to be reliable and valuable then researchers must be very clear about the aims and objectives of their studies. On the other hand, they must also design their studies in such a way that this is possible.

One more criticism is that data are lacking since qualitative research usually focuses on very small participant groups and utilizes methods such as interviews and observations. It could be difficult to extrapolate the results to a larger population as a result. However, by carefully planning the study and utilizing a range of diverse data sources, this criticism can be disproved (Sahu and Singh, 2016). Another common critique is that qualitative research initiatives are challenging to replicate because qualitative studies are conducted under precise circumstances. However, this issue could resolve if the researchers are open and honest about the data gathering procedures they used, as well as provide detailed descriptions of the study design and data collection methodologies (Baker, 2000).

One example of qualitative research is a study by Mount and Garcia Martinez (2014). They used a developing analytical framework called systematic combining to further the theory on the topic matter under consideration. They contend that the multiple exploratory case study design must be modified because research objectives are new and current studies are restricted, and this strategy ensured the validity and dependability of the research findings and it is much more convincing and accurate if it is based on several different sources of information following a corroborative mode (Sahu and Singh, 2016).

Despite these objections, qualitative research is nevertheless a crucial method for examining issues in education. When done correctly, qualitative research has the potential to reveal incredibly rich and in-depth information about the participants' experiences and points of view (Baker, 2000).

Quantitative Research Methodology

In educational research, quantitative research approaches have long dominated the field. Nevertheless, there is a growing body of criticism of quantitative techniques. A reductionist approach to data is a major argument against quantitative research because it leads to the lack of understanding the difficulties of educational procedures (Yue and Xu, 2019). For example, when using quantitative methodologists tend to focus on a limited number of variables and try to evaluate them in a highly regulated situation. This may result in a lack of understanding of the contextual factors that may have an effect on the incident that is the subject of the investigation (Brooman & Darwent, 2014).

One of the reasons quantitative research is criticized is that it usually uses a fixed laboratory kind of artificial setting in a particular milieu or any educational institutes that may not be a true representation of real world educational problems. Thus, the results of the quantitative study may be difficult to extrapolate to a larger population (Fink, 2003).

One of the studies by Garriga, von Krogh, and Spaeth (2013) is based on an earlier investigation into open innovation by Laursen and Salter (2006), which examined the impact of U.K. manufacturing firms' search strategies for outside knowledge on their ability to innovate. The study was the replication and expansion of an earlier study, so the researchers made every effort to maintain the original sample size, methodology, and survey as closely as they can, however, by adding to the L&S model, they could not increase the model's generalizability through its replication in other situations (Yue and Xu, 2019).

Mixed Research Methodology

According to Tashakkori and Teddlie (2003), it is possible to see a set of different but opposing preoccupations in both quantitative and qualitative research. Measurement, causality, generalization, and reproducibility are highlighted in quantitative research. It is asserted, however, that over the past several years mixed methods research—which combines the use of quantitative and qualitative approaches in a single study—has advanced quickly. Due to this, mixed methods research is quickly rising to become the third most popular method. Both qualitative and quantitative research methods have allegedly come under heavy fire (Johnson and Onwuegbuzie, 2004). It is common in the field of education to use a number of research methodologies. Employing mixed techniques offers many advantages, including the ability to gather data from various sources and triangulate data to increase its level of validity. Research that integrates multiple methodologies, nevertheless, may also face some potential detractors. According to some academics, mixed methods studies are typically conducted in a random manner and it is only occasionally simple to usefully blend qualitative and quantitative data.

As an example, a review of mixed methodology by Storey et al (2002) could be discussed. They used a mixed-method approach to analyze the company's ability to innovate. A self-completion questionnaire in the form of a postal survey and structured interviews were conducted. However, only a 25% response rate is achieved in the postal survey under review (as cited in Snyder, 2019). Johnson and Onwuegbuzie (2004) argue that lower than 50% response rates to postal surveys are unacceptable because they make it impossible to verify the authenticity of the results. Also, the responses from the few questions in the questionnaires and interviews showcased very different responses (as cited in Snyder, 2019).

It was concluded that the mixed research under consideration had issues with the generality of its findings and that these issues are most likely caused by the decision to use a postal survey as the main research instrument. But if the writers' main objective is to learn new things rather than generalize their findings, then a lesser level of validity and generality should not be a major concern (Snyder, 2019).

Despite the challenges it provides, mixed methods research, which is a relatively new type of investigation, has the potential to result in a more thorough understanding of the phenomenon being studied. The limitations of conventional research methods can

sometimes be overcome while simultaneously producing new knowledge in research that blends quantitative and qualitative methods (Johnson and Onwuegbuzie, 2004).

Theoretical and Practical Considerations

Disciplinary Preferences and Journal Expectations

A good study design enables the researcher to gather the information required to respond to the research question. The most appropriate research design will depend on the kind of data being gathered, the resources available, and the project's time frame (Snyder, 2019).

One consideration is the study's applicability to the field or region. For instance, humanities are prone to employ more qualitative approaches than quantitative ones, whereas natural sciences prefer to use more quantitative methodologies. These distinctions and personal preferences for research methodology are not separate (Johnson and Onwuegbuzie, 2004). The type of research methodologies to be employed might occasionally be influenced by things like journal selection. More journals than any other type specializes in publishing quantitative data. Additionally, because of this tendency, there are now numerous journals with a focus on publishing qualitative research (Kour, 2014).

Ethical and Epistemological Considerations

Another important consideration is that the choice of research methodology and design is affected by numerous elements, including epistemological issues, goals, standards of conduct, the sort of research questions put forth, organizational requirements, and ethical, political, and personal considerations (Akaranga and Ongong'a, 2013; Chawla and Sodhi, 2011).

Ethical and epistemological issues must be resolved in order for the consumers of educational research to have faith in the study's methodology and discourse, as well as its methodological approach and discourse. Most people concur that a set of rules and conventions that distinguish between acceptable and unacceptable behavior define and limit human activity. Additionally, most funders of educational research request that the project's ethical guidelines be explicitly stated prior to securing any funding. When educational research initiatives are done, institutional ethical committees assess them for ethical issues (Snyder, 2019). The number of these committees has increased recently, as has the emphasis on research involving human beings. The larger institutional committees draw their policy recommendations from a number of other committees that act as a sort of overarching moral compass (Johnson and Onwuegbuzie, 2004).

Example of Elite Bias in Qualitative Research

However, research especially qualitative methodology is more prone to ethical issues. One of the examples is an elite bias which is an informant bias. This bias involves giving more weight to data from articulate, knowledgeable, typically high-status informants while giving less weight to data from difficult, less articulate, lower-status informants (Snyder, 2019). By carefully examining opposing viewpoints, carefully organizing the selection of informants, and actively searching for contrasting situations (negative, extreme, and countervailing), the researcher can incorporate safeguards against this bias (Chawla and Sodhi, 2011). For all kind of research with human, researchers are typically expected to obtain informed consent from participants, protect

people from harm, and guarantee anonymity. It is crucial to think about the technique and method to utilize when conducting research on the subject of education.

Macro, Meso, and Micro Levels of Educational Research

Furthermore, this is anticipated to guarantee that the study is of the best quality and the conclusions are thoughtful and useful (Brown and Krager, 1985). Educational research has different levels of operations, such as the macro level which deals with education policy and outcomes, the meso level, which focuses on education practice within specific context; and finally, the micro level that examines the learning process and ways this can be facilitated (Snyder 2019).

Conclusions

Educational research is a planned effort to learn more about the educational process in order to make it more successful. Because we view education today, there is a need for more research. There are different strategies and methodologies that can be used in educational research, and each has its own advantages and disadvantages but it is important to select the appropriate methodology or approach for the subject (Kumar, 2005).

The kind of study procedures researchers can use to support their work and the techniques that can be used to collect data are determined by the research questions. Data that can be statistically examined are frequently collected through the use of quantitative research. When determining what is occurring and how frequently it occurs, this kind of research is frequently employed as a response. Quantitative data is most likely to measure variables, validate pre-existing theories or assumptions, or challenge them (Brooman & Darwent, 2014). New hypotheses are frequently developed using data that has been gathered regarding various variables and are then based on the findings. Due to the fact that many people only feel safe with numbers and statistics, one's coworkers are frequently considerably pleased about the capacity to check quantitative facts. Data that can be statistically examined are frequently collected through the use of quantitative research. When determining what is occurring and how frequently it occurs, this kind of research is frequently employed as a response (Yue and Xu, 2019).

To grasp meanings, opinions, and experience, however, it is sometimes not enough to collect statistics and crunch numbers; instead, qualitative data is needed. Qualitative research is frequently employed to thoroughly examine educational difficulties. It can be utilized to comprehend the perspectives of educators, administrators, and students. It is used when a researcher wants to comprehend meanings, examine, characterize, and comprehend experiences, concepts, beliefs, and values, as well as intangibles like these. For instance, research on students' subjectively reported and understood study methods and learning styles, or students' learning styles and approaches, would benefit from qualitative methods (Mohajan, 2018).

In educational research, both qualitative and quantitative research is crucial. Each offers distinct advantages and disadvantages, and each works well for particular kinds of inquiries. Numerous significant findings have been drawn as a result of the criticism of educational research approaches and methods (Brooman & Darwent, 2014). To resolve the common issues with qualitative or quantitative methodology, a mixed methods research design is used that is the combination of quantitative and qualitative research techniques, and it can also serve to raise the caliber and usefulness of educational

research because it allows triangulation of data that can be obtained both qualitatively or quantitatively (Sahu and Singh, 2016).

In conclusion, in addition to understanding the research methods and methodologies, the researcher must also be aware of the norms and underlying assumptions of various approaches because this implies that the researchers must design their methodology uniquely for their research problems, questions, or hypotheses (Brooman & Darwent, 2014)

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