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(Research) Article

Educational Research Methods: Analysis of Quantitative and Qualitative Research Paradigms

Asdlori [1*], Atabik [2], Mukroji[3], Muhamad Slamet Yahya [4], Khafifatul Fian [5]

[1-5]UIN Prof. K. H. Saifuddin Zuhri Purwokerto
Addres: Jl. Ahmad Yani No. 40A, Purwokerto, Kabupaten Banyumas, Jawa Tengah 53127
*****Corresponding Author: e-mail: asdlori@uinsaizu.ac.id

Abstract: This paper analyzes the differences between the quantitative and qualitative research paradigms. The method used is a literature review, involving exploring various sources, including books and articles, related to the topic. After gathering the data, the author analyzes it based on its content and concludes the findings. The results show that in research, the positivist paradigm, or scientific research, and the post-positivist paradigm, or naturalistic research, tend to be more dominant. These two paradigms can be selected or combined depending on the data or problem being studied by each researcher. The positivist paradigm is commonly used in quantitative research, while in qualitative research, the post-positivist paradigm is more frequently applied. In practice, the selection of a paradigm is adjusted according to the research problem to produce comprehensive and in-depth studies. Additionally, the appropriate choice of paradigm clarifies the research direction and provides each researcher with ease in developing knowledge theories based on the data collected in the field.

Keywords: Educational; Paradigm; Qualitative; Quantitative; Research.

1. Introduction

Humans are social beings who constantly develop in accordance with their civilization. This process of development involves their rational ability to advance knowledge. A proper understanding must be accompanied by an appropriate methodology (approach), as through methodological approaches humans are able to responsibly develop knowledge. Research is one of the essential aspects that plays a significant role in the advancement of science. Based on its approach, research is generally divided into quantitative and qualitative research (Prayogi et al., 2024).

In relation to quantitative research, it is defined as a research approach that involves the process of calculation or, in other words, the use of numbers (Situmorang & Cahyani, 2023). On the other hand, qualitative research is a method employed to investigate natural phenomena, in which the researcher serves as the key instrument (Haryono, 2020).

Both qualitative and quantitative research processes originate from a research paradigm. A research paradigm serves as a philosophical foundation that shapes the researcher's perspective on the phenomena being studied, as well as guides the process of data collection and analysis (Andini et al., 2022). Moreover, within the realm of social sciences, paradigms influence how events can be understood and explained (Pratama & Dhian, 2020). Despite this, researchers often experience uncertainty when choosing the most appropriate research paradigm. Many encounter difficulties in selecting the paradigm that best suits their study. This challenge may be influenced by several factors, including limited understanding of philosophical concepts, differing research contexts, and difficulties in integrating different paradigms (Rosyidin, 2020).

From the author's review, research paradigms have been widely discussed in various studies, such as in the article "Penelitian Ilmiah (Kuantitatif) Beserta Paradigma, Pendekatan, Asumsi Dasar, Karakteristik, Metode Analisis Data dan Outputnya" (Afif et al., 2023), "Paradigma Penelitian Kualitatif dan Filsafat Ilmu Pengetahuan dalam Konseling" (Batubara,

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2017), "Paradigma Penelitian Kualitatif Dalam Bisnis" (Susanti, 2014), dan artikel yang berjudul "Paradigma Penelitian Kuantitatif Dalam Jurnal Ilmiah Metodologi Penelitian Kuantitatif" (Andini et al., 2022).

In light of these previous works, the purpose of this paper is to analyze the differences between the quantitative and qualitative research paradigms. This constitutes the novelty of this study compared to the aforementioned works. To collect the data, the author employed a literature review method by examining several relevant books and articles. To complement the data, a questionnaire was also distributed to identify which research method quantitative or qualitative is more frequently used. After the data were collected, they were analyze and subsequently concluded.

2. Proposed Method

This research is a literature study, with data collection carried out through the examination of books, articles, and other sources relevant to the topic under discussion. The books and articles used by the researcher are publications released within the period of 2014–2024 (the last ten years). Once the data were collected, the researcher conducted a selection process to identify materials that were most relevant to the study. The selected data were then analyzed using content analysis techniques, followed by the final step of drawing conclusions.

3. Results and Discussion

Quantitative and Qualitative Research

From a terminological aspect, quantitative research is characterized as an objective type of research, encompassing data collection and quantitative data analysis using statistical testing methods (Susanto et al., 2024). The aim of quantitative research is to test hypotheses related to learning models and theories that contribute to the development of education (Rukminingsih, 2020). Data collection in quantitative research can be conducted through interviews, whether structured or unstructured, testing techniques, or questionnaires (Yasin et al., 2024). Accordingly, quantitative research emphasizes theory testing through the measurement of variables and data analysis expressed in numbers using statistical calculations (Millah et al., 2023).

According to Rukminingsih et al. (2020), quantitative research fundamentally employs a deductive–inductive approach. This means that it begins with a theoretical framework, experts' ideas, or the researcher's own understanding based on experience, which is then developed into research problems along with their solutions to obtain truth in the form of empirical data from the field.

Bariah et al. state that quantitative research is a method that uses numerical data to measure and analyze social phenomena (Bariah et al., 2024). Such numerical data may be obtained from surveys, experiments, or observations (Rustamana et al., 2024). It is further explained that quantitative research relies on data samples, which are analyzed mathematically through questionnaires, opinion polls, tests, or other instruments, thereby supporting the use of numbers and statistics to explain social phenomena, test hypotheses, identify patterns, and measure relationships among variables (Bariah et al., 2024).

According to Afif et al., quantitative research is based on the assumption that reality has a single and stable dimension, thus making it predictable. Variables can be identified and measured through objective and standardized instruments (Afif, 2023). Based on these explanations, the author concludes that quantitative research is conducted with the intention of testing or verifying theories based on predetermined variables. These variables can be measured through appropriate data collection techniques, thereby yielding results derived from collected data.

Several characteristics of quantitative research can be identified (Rustamana et al., 2024):

a. Employs a deductive reasoning pattern (rational empirical or top down).
b. Uses positivistic logic, avoiding subjective elements.
c. Research procedures follow a predetermined plan.
d. Aims to establish nomothetic knowledge, i.e., knowledge that seeks to formulate laws from generalizations.
e. Subjects, data, sources, and instruments are aligned with what was predetermined.
f. Data collection is conducted through measurements using objective and standardized tools.
g. Involves numerical calculations or quantification of data.
h. The researcher positions themselves separately from the research object, without emotional involvement.

i. Data analysis is performed after all data has been collected.
j. Researchers must master statistical techniques for data analysis.
k. Results aim for generalization and prediction, independent of time and context.
l. Quantitative research is also referred to as scientific research.

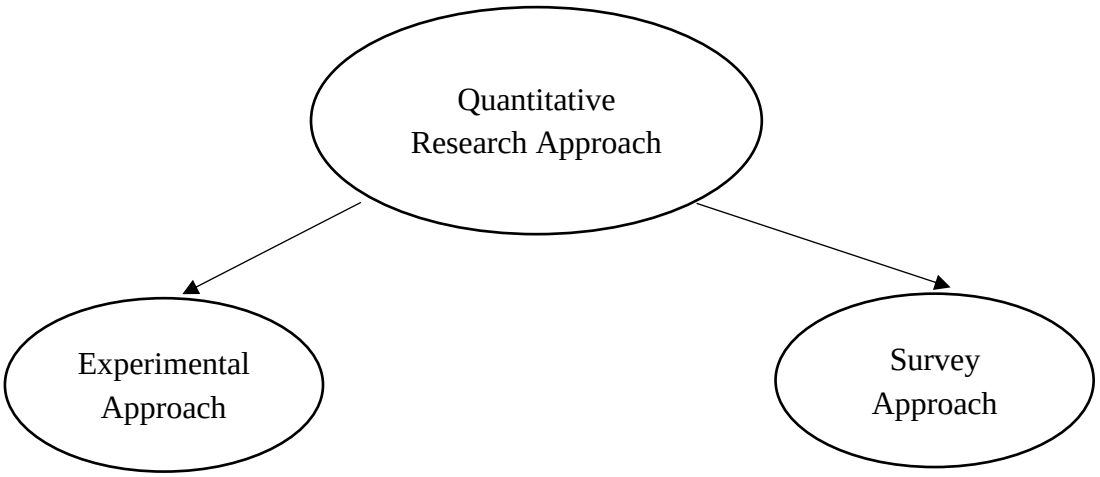

Figure 1. Quantitative research approaches

Based on Figure 1, there are two approaches that can be applied in quantitative research. The first is the experimental approach. According to Creswell, experiments are used to test causal relationships by manipulating one or more independent variables and measuring their effects on the dependent variable. The second is the survey approach, which is employed to collect numerical data from large samples in order to describe the attitudes or opinions of a particular population (Creswell, 2018).

Qualitative Research

Qualitative research is a method employed to study natural objects, in which the researcher serves as the key instrument. It is often referred to as a naturalistic research method because it is conducted under natural conditions. Furthermore, it is also called an ethnographic method, as it was initially more widely used in cultural anthropology research (Sugiyono, 2016).

According to Nababan and Meida, qualitative research emphasizes deep understanding of phenomena through interpretation, analysis, and the comprehension of meanings constructed by individuals or groups under study. It highlights the social context, complexity, and dynamics of phenomena (Nababan et al., 2024).

The in-depth exploration process in qualitative research aims to provide thorough explanations of phenomena, stressing the importance of data depth and detail. The deeper and more comprehensive the data collected, the higher the quality of the research (Noor, 2015). Thus, qualitative research assumes that reality cannot be observed partially or divided into variables. Instead, it views reality as dynamic, constructed through thought and interpretation of observable phenomena, and inherently holistic (Sugiyono, 2016).

Therefore, qualitative research can be defined as a method that seeks to understand phenomena in depth through interpretation, descriptive analysis, and meaning-making. Consequently, qualitative researchers are required to explore data extensively, as research quality improves with greater data depth.

Key characteristics of qualitative research (Sugiyono, 2016):

a. Conducted in natural settings, with the researcher as the main instrument.
b. Descriptive in nature, with data expressed in words or images rather than numbers.
c. Focuses more on processes than outcomes.
d. Data analysis is inductive.
e. Emphasizes meaning.

According to Creswell, five approaches may be applied in qualitative research:

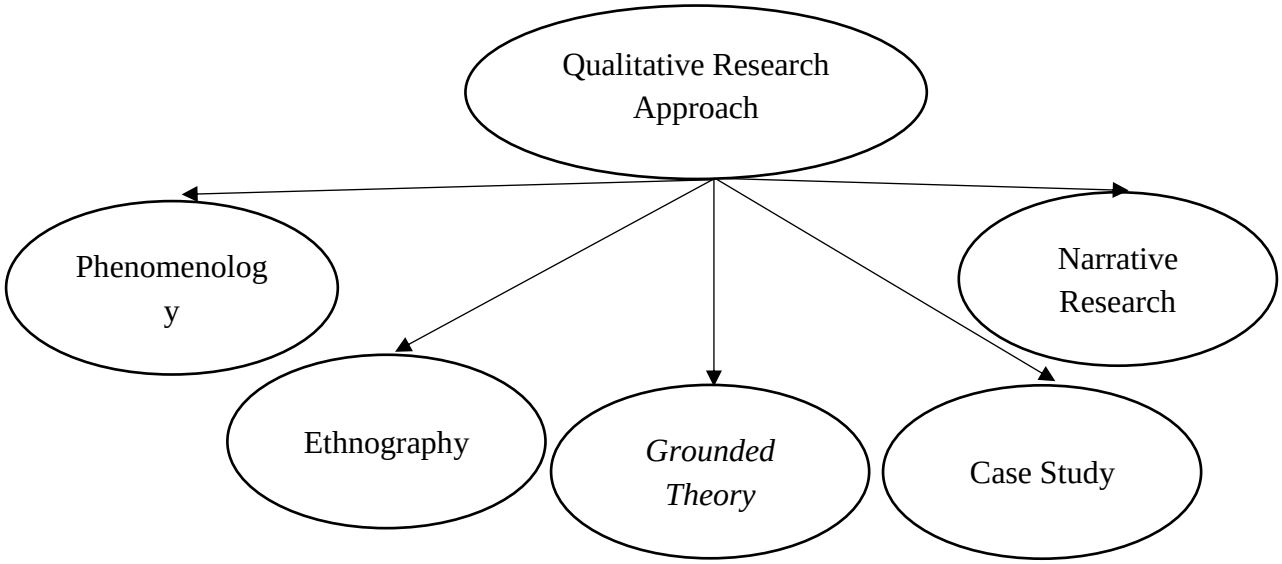

Figure 2. Qualitative research approaches

Based on Figure 2, it can be explained that there are five approaches that can be applied in qualitative research. First, phenomenology, which is used to understand an individual's subjective experience regarding a phenomenon. Second, ethnography, which aims to explore culture, values, beliefs, and attitudes within a social group. Third, grounded theory, which is employed to develop theory based on data collected directly from the field. Fourth, the case study approach, which seeks to conduct a comprehensive exploration of a particular case. Fifth, the narrative approach, which is used to analyze individual stories and understand how meaning is constructed from lived experiences (Creswell, 2018).

For further clarification, the author presents the following table comparing quantitative and qualitative research (Sugiyono, 2016):

Table 1. Differences between quantitative and qualitative research

Quantitative Method	Qualitative Method
Design: Specific, detailed, and predetermined as a step-by-step guide	Design: General, flexible, emerging throughout the research process
Purpose: To show relationships among variables, test theories, and generate predictive generalizations	Purpose: To identify interactive relationships, develop theories, describe complex realities, and derive meaning
Data Collection: Questionnaires, structured observation, structured interviews	Data Collection: Participant observation, in-depth interviews, documentation, triangulation
Instruments: Tests, questionnaires, structured interviews	Instruments: Researcher as the instrument, notebooks, recorders, cameras, supporting tools
Data: Quantitative, operationalized measurements using instruments	Data: Descriptive, personal documents, field notes, respondents' words and actions
Samples: Large, representative, often random and predetermined	Samples: Small, non-representative, purposive or snowball sampling, evolving during research
Analysis: Conducted after data collection, deductive, using statistics	Analysis: Ongoing from start to finish, inductive, seeking patterns and models
Researcher–Respondent Relationship: Detached, minimal contact, hierarchical, short-term	Researcher–Respondent Relationship: Empathetic, equal status, long-term for data saturation
Proposal Design: Detailed, literature-based, clear hypotheses	Proposal Design: General, tentative, literature secondary, no hypotheses at outset
Completion: Ends when planned activities are finished	Completion: Ends when no new data emerges (saturation)
Validity: Tested through instrument validity and reliability	Credibility: Tested through credibility checks

After presenting the table comparing quantitative and qualitative research, the author also presents the results of a questionnaire that was designed to identify which research method is most frequently used quantitative or qualitative as well as the reasons for choosing that particular method. The results of the questionnaire are shown in Figure 3 and Table 2 below:

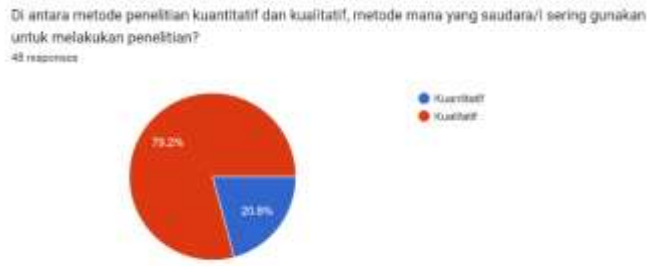

Figure 2. Diagram Results of quantitative and qualitative research methods

From the questionnaire results above, it can be interpreted that a majority of 48 respondents preferred to use the qualitative research method rather than the quantitative one. The percentage score shows that 79.2% of respondents chose qualitative research, while the remaining 20.8% opted for quantitative research. The reasons for selecting each method are summarized in Table 2 below:

Table 2. Reasons for using quantitative and qualitative research methods

Quantitative Method	Qualitative Method
Easier to prove theories	Easier to understand
Skilled in using tools for statistical data processing	Not limited to numbers, which are sometimes manipulated
Allows for stronger generalization, systematic hypothesis testing, and objective results	Provides deeper understanding of phenomena and is more flexible in responding to initial findings
Less subjective and does not require strong writing skills	Data collection techniques are more in-depth through observation and interviews
Can reach a larger number of subjects	More interested in describing problems in depth

Based on Table 2, it can be interpreted that the determination of the research method to be used largely depends on the objectives and the formulation of the research problems. In quantitative research, the primary aim is to test theories through the formulation and examination of hypotheses. Naturally, hypothesis testing requires the ability to process and analyze collected data rather than merely describing it. This becomes one of the main reasons why the quantitative method is less frequently chosen by some respondents. Nevertheless, the choice of method ultimately returns to the research objectives: when the researcher seeks to gain an in depth understanding of a phenomenon, the qualitative method is more appropriate; conversely, when the researcher aims to test theories and requires a broader research population, the quantitative method is the suitable choice.

Research Paradigms

From a terminological perspective, a paradigm is a set of concepts, beliefs, values, methods, assumptions, or rules that form the framework for conducting research. According to Elfrianto and Gusman, paradigms are divided into two categories: the positivistic paradigm (science is based on established laws and standardized procedures) and the interpretive paradigm (each phenomenon may carry different meanings). The positivistic paradigm gives rise to a quantitative approach, in which data are presented in numerical form or transformed into numbers. In contrast, the interpretive paradigm gives rise to a qualitative approach, in which data are expressed in words (Elfrianto & Lesmana, 2022).

According to Creswell, research paradigms can be classified into four types: post-positivism, constructivism, transformative, and pragmatism. First, the post-positivist paradigm represents a line of thought that emerged after the positivist view. In post-positivism, researchers challenge the notion of absolute truth and knowledge, emphasizing that nothing can be regarded as entirely objective or completely positive (Sugiyono, 2016). Within this perspective, it is assumed that causes may potentially determine certain effects or outcomes. The issues analyzed are related to the identification and assessment of causal relationships that may influence results. In practice, researchers employing post-positivism usually begin with a theory, collect data, revise it, and then conduct additional testing (Sugiyono, 2016).

Second, the constructivist paradigm emphasizes the contextual construction of knowledge. This means that an individual's knowledge is not only shaped by the information received but is also influenced by social context, culture, and personal experiences (Bofe & Adam, 2024). Third, the transformative paradigm serves as a research framework that stresses principles of social justice and the social responsibility of science (Madyaningrum, 2023). Fourth, as explained by Yulianty & Ali, the pragmatic paradigm is not bound to a single philosophical system or reality. It may be described as a paradigm that provides a philosophical framework for mixed-methods research. Pragmatism places the research problem at the center and applies any approach deemed useful for understanding the problem (Yulianty & Jufri, 2020).

Uno explains that there are indeed many paradigms, as outlined above. However, the two that dominate the realm of knowledge are the scientific paradigm and the naturalistic paradigm. The scientific paradigm originates from positivism, while the naturalistic paradigm is rooted in post-positivism. The differences between the two, in terms of their axioms, are presented in Table 3 (Uno, 2020):

Table 3. Axiomatic differences between positivism and post-positivism

No.	Aksioma	Positivisme	Post-positivism
1	Nature of Reality (Ontology)	Nature of Reality (Ontology)	Nature of Reality (Ontology)
2	Relationship between Knower and Known	Relationship between Knower and Known	Relationship between Knower and Known
3	Possibility of Generalization	Possibility of Generalization	Possibility of Generalization
4	Possibility of Causal Relationships	Possibility of Causal Relationships	Possibility of Causal Relationships
5	Role of Values	Role of Values	Role of Values

Based on Table 3, it is clear that there are fundamental differences between the positivist and post-positivist paradigms, ranging from the nature of reality, the relationship between the knower and the known, the possibility of generalization, the possibility of causal relationships, and the role of values. In Uno's work, a schematic representation is also provided to clarify the levels of social reality, which consist of four layers, referring to Ritzer's framework of social reality levels, as follows (Bofe & Adam, 2024):

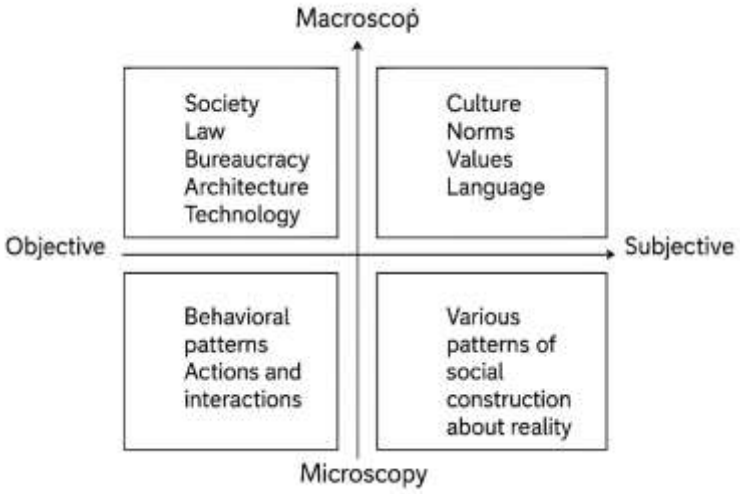

Figure 4. Ritzer's levels of social reality

From Figure 4, it can be explained that quadrants 1 and 2, namely the macro-objective and macro-subjective domains, serve as the basis for researchers conducting quantitative studies. Meanwhile, quadrants 3 and 4, or the micro-objective and micro-subjective domains,

provide the foundation for qualitative research. Specifically, each of the four paradigmatic quadrants (1, 2, 3, and 4) has its own distinct characteristics. Thus, although quadrants 1 and 2 belong to the quantitative research domain, they still demonstrate unique features that must be carefully considered in research practice.

Quadrant 1 examines experimental research that focuses on causal relationships, determinism, verification or falsification, and reductionism. Quadrant 2, while also within the quantitative paradigm, deals with quasi-experimental research, which similarly seeks causal relationships, determinism, verification or falsification, and reductionism. On the other hand, quadrants 3 and 4 represent the qualitative research domain. The distinction between them lies in the fact that in quadrant 3, qualitative researchers still make use of theoretical support either to build new theories or to reject existing ones, whereas quadrant 4 represents the domain of pure qualitative inquiry (Uno & Lamatenggo, 2016).

The Benefits of Paradigms

Regarding the benefits of paradigms, Uno (2020) explains several advantages of having a research paradigm, including the following (Uno & Lamatenggo, 2016):

a. Reminding researchers of their key position concerning the object of knowledge, both in terms of *formal objects* and *material objects*.
b. Since qualitative researchers deal with complex and value-free social realities, epistemologically they must be able to determine the appropriate branch of science in examining their research objects.
c. Facilitating researchers in exploring data for the purpose of developing theories derived from the field of study.
d. Guiding the direction, process, methodological choices, techniques, categorization, and analysis in research.
e. Reminding researchers to consciously approach research participants as individuals in a complete and holistic manner.
f. Simplifying the process for researchers in developing knowledge theories based on empirical field data.
g. Preventing the presence of subjectivity on the part of the researcher.
h. Assisting researchers in developing epistemology, methodology, and the logic of knowledge.

4. Conclusions

The existence of paradigms in research provides convenience for researchers, as paradigms function as guides in determining the direction, process, techniques, and methodological choices of a study. In research, the paradigms that tend to dominate are positivism, also referred to as scientific research, and post-positivism, also referred to as naturalistic research. These two paradigms may either be selected individually or combined, depending on the data or the problems to be examined by the researcher.

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