

UMT Education Review (UER)

Volume 8 Issue 1, Spring 2025

ISSN(P): 2616-9738, ISSN(E): 2616-9746

Homepage: <https://journals.umt.edu.pk/index.php/uer>



Article QR



Title: Exploring Qualitative, Quantitative, and Mixed Methods: A Comprehensive Review in Educational Research

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DOI: <https://doi.org/10.32350/uer.81.02>

History: Received: April 12, 2025, Revised: April 28, 2025, Accepted: May 22, 2025, Published: June 10, 2025

Citation: Mujeeb, N., Ali, A., & Anam, S. (2025). Exploring qualitative, quantitative, and mixed methods: A comprehensive review in educational research. *UMT Education Review*, 8(1), 24–60. <https://doi.org/10.32350/uer.81.02>

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Conflict of Interest: Author(s) declared no conflict of interest



A publication of

Department of Education, School of Social Sciences and Humanities
University of Management and Technology, Lahore, Pakistan

Exploring Qualitative, Quantitative, and Mixed Methods: A Comprehensive Review in Educational Research

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Abstract

There are several kinds of educational research with benefits and drawbacks. Examining the two main approaches in educational research, qualitative and quantitative, this research discusses their respective merits, drawbacks, and their appropriateness. Fundamentally interpretive, qualitative research is distinguished by a search for a depth of meaning and a strong dependence on the case study method, interviews and ethnographic techniques. It is strong for probing for contextual richness but could run across problems with poor generalizability, research bias, and time. In contrast, quantitative research is based on statistical analysis and emphasizes objectivity, making it suitable for generalization. It relies heavily on surveys, experiments, and standardized tests to collect data. However, quantitative methods may overlook the nuanced and subjective aspects of human behavior, failing to capture the complexities of educational events. The paper also looks at the mixed methodological combination of qualitative and quantitative approaches to grasp educational issues fully. Finally, the consequences of method selection, its effect on the results, and suggestions for future projects are discussed for educational researchers.

Keywords: Educational research, mixed-methods, qualitative research, quantitative research, reliability in education, validity in education

Introduction

Since time immemorial, explaining the world and natural phenomena has always been a human quest. Thinking about and searching for that explanation could even be described as systematic. Types of knowledge production have shifted from what Aristotle led through the use of syllogism, and Bacon, who began an inductive movement to arrive at

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knowledge creation as a result of empirically observed data (Kunisch et al., [2023](#)). This continuum of inductive-deductive approach is still in widespread use today, and it serves as the foundation of contemporary scientific inquiry, especially in educational research.

Research in education and other social sciences is structured within two major paradigms, the scientific or positivist paradigm, and the interpretive or constructivist paradigm. These paradigms underlie different ontological and epistemological views, consequently influencing methodological inclinations: quantitative for the former and qualitative for the latter (Omodan, [2024](#)). The scientific paradigm pursues discovering universal truths through quantifiable evidence, while the interpretivism paradigm focuses on subjective meanings and context-based veracities (Pervin & Mokhtar, [2022](#)). However, the dichotomy between these paradigms has sparked controversy and what academics call the “paradigm wars”. These controversies express philosophical disagreements and tension on the application level, particularly in fields such as education, where measurable effects and contextual understanding are equally indispensable. Quantitative approaches are also frequently prioritized for educational policy research because of their potential to establish causality and generalization. On the other hand, qualitative studies provide rich data on processes, experiences, and localized causes - that are fundamentally very important for explaining why educational practices work or fail in a particular context (Lim, [2025](#)).

Founded in a pragmatic paradigm, mixed methods research responds to these methodological tensions. Advocates of combining qualitative and quantitative approaches argue that it helps researchers fully handle complex educational problems, balancing the demand for empirical accuracy with contextual sensitivity. Moreover, innovative ideas like Qualitative Comparative Analysis (QCA) show how increasingly hybrid approaches could find causal links in small-N studies while preserving depth and complexity (Finn, [2022](#)). Even with the rising corpus of methodological literature and readily available tools like the Handbook of Mixed Method Research (Poht, [2023](#)), many inexperienced researchers still struggle to negotiate these approaches. The effective integration of several approaches within educational research, multidisciplinary communication, and a more exact direction on methodological adaptation is still critical.

This work, thus, evaluates approaches of educational qualitative and quantitative research. Using analysis of their philosophical foundations, methodological approaches, and practical applications, this study seeks to assist researchers, especially students and early-career scholars, in choosing appropriate research designs that match their research questions and paradigm orientations. The paper also underlines the need for mixed methods as a tailored and pragmatic approach to educational research, generating more thorough and reliable knowledge of challenging educational events.

Understanding Research Paradigms in Education

Two basic paradigms in social and educational research, positivism and interpretivism, offer different perspectives on reality and knowledge development. Rooted in the scientific legacy, positivism holds that observable, measurable reality is objective and stable. This paradigm stresses testing hypotheses and deriving generalizable conclusions using quantitative approaches, including surveys, statistical analyses, and experiments (William, [2024](#)). Emphasizing measured results and causal relationships, positivist researchers seek objectivity, dependability, and repeatability. On the other hand, interpretivism—sometimes known as constructivism is predicated on the belief that reality is essentially subjective and socially produced. It acknowledges several realities shaped by surroundings, cultures, and personal experiences. Interpretivism researchers apply qualitative tools, including case studies, observations, and interviews, to understand meanings, beliefs, and lived events. Aiming for depth of knowledge and contextual richness rather than universal laws, interpretivism celebrates the uniqueness of every educational environment and participant (Ikram & Kenayathulla, [2022](#)).

Philosophical underpinnings, including ontology and epistemology, partly define research paradigms and direct methodological choices. Ontology tells the nature of reality and what exists; epistemology is concerned with the nature and sources of knowledge and how we know what we know. The realistic ontological perspective of positivist research holds that one objective reality exists apart from the human experience. Objectivism, the related epistemology, holds that by detachment, one can acquire knowledge by objective observation and empirical measurement (Pretorius, [2024](#)). This shapes a taste for methodical, homogeneous research projects aiming for generalizability. Conversely, interpretivism research

adopts a relativist ontological stance and recognizes that reality is subjective and varies depending on individuals' points of view and social contacts. Constructivism is its epistemological posture; it holds that the subjects and researcher co-create knowledge. Interpretivism research emphasizes thus flexible, emergent designs that prioritize meaning, interpretation, and context (Omodan, [2022](#)).

Research paradigms directly influence researchers' perspective and their approach to planning and carrying out their studies. Emphasizing objectivity and measured variables, a positivist paradigm fits quantitative methods using structured instruments (such tests) and statistical tools to test hypotheses and produce generalizable results. Sometimes, positively oriented positivist research in education focuses on outcomes, performance indicators, and thorough evaluations of policies or interventions. The interpretivism paradigm guides researchers in selecting qualitative approaches using an in-depth investigation of participant perspectives, procedures, and environments (Omodan, [2022](#)). Among the instruments available to interpretivism for rich, detailed insights into educational events—including classroom dynamics, teacher beliefs, or student learning experiences—are interviews, focus groups, and ethnographic observation. Moreover, the evolution of the pragmatic paradigm has encouraged mixed methods, allowing researchers to use the benefits of both qualitative and quantitative approaches. This paradigm encourages flexibility in method choice depending on the nature of the research question rather than strict adherence to a single viewpoint (Treagust & Won, [2023](#)). For a problem, a study might begin with qualitative interviews and then move on to a quantitative survey to validate findings for a more general population. Table 1 shows the summary of the research paradigms in education.

Table 1

Comparison of Positivism, Interpretivism, and Pragmatism: Conceptual Overview

Aspect	Positivism	Interpretivism	Pragmatism
Ontology	Reality is objective and singular	Reality is subjective and multiple	Reality is practical and dependent on context

Aspect	Positivism	Interpretivism	Pragmatism
Epistemology	Knowledge gained through observable facts	Knowledge gained through subjective meanings	Knowledge gained through what works practically
Research Focus	Testing hypotheses, generalizable laws	Understanding meanings, context-specific	Problem-solving, combining methods
Typical Methods	Surveys, experiments, statistical analysis	Interviews, observations, case studies	Mixed methods, flexible designs
Strengths	Objectivity, replicability, generalizability	Rich, deep contextual understanding	Flexibility, comprehensive insights
Limitations	May overlook context, lacks depth	Limited generalizability, subjective bias	Complexity, requires methodological skill

Qualitative Research in Education

Qualitative research is a technique underlined in educational environments stressing investigating and understanding the experiences, activities, and interpretations attached to their social reality by people and groups (Ponce et al., [2022](#)). While quantitative research primarily seeks to test hypotheses and measure variables, qualitative research employs descriptive and inductive methods to understand the complexity of educational events.

Definition and Characteristics

Important aspects of qualitative education research consist of the following:

Contextual Understanding

Knowledge of the surrounding educational activities is basic in qualitative research. Researchers fully enter the environments where teaching and learning occur in classrooms, colleges, towns, etc., capturing rich and complex educational experiences (Beck et al., [2023](#)).

Inductive and Exploratory

Usually using an inductive method, qualitative research begins with observations and data collecting to create hypotheses or theories regarding educational events. Often investigating the complex or uncharted territory of education without clear direction or predefined expectations, researchers aim to build a deeper understanding of phenomena as they emerge from the data (Proudfoot, [2023](#)).

Emic Perspective

Unlike imposing their interpretations, qualitative researchers try to grasp educational events from the participant's point of view. This runs against the etic approach sometimes used in quantitative research, which stresses how researchers view the issues under analysis (El Messaoudi, [2024](#)).

Rich Data Collection

In qualitative research, rich data collecting, including comprehensive and detailed information obtained using interviews, focus groups, observations, and document analysis, often refers to the process of gathering in-depth insights into participants' experiences. This material provides a thorough understanding of participants' viewpoints, experiences, and ideas on educational issues, offering a complete awareness of the context and complexities involved (Khan et al., [2025](#)).

Theoretical Sensitivity

Theory shapes qualitative education research rather extensively. Researchers allow these frameworks to evolve depending on data-based findings even while they bring already-existing theoretical models to their studies (Luft, [2022](#)).

Non-Generalizability and Specificity

While quantitative research seeks generalizability across populations, qualitative research emphasizes on understanding specific situations or cases. This iterative process enables the creation of fresh theories from the learning environments under research. Researchers might not want to generalize conclusions to more people even if they wish to provide comprehensive insights into the particular setting of their research (Dehalwar & Sharma, [2024](#)).

Theoretical Foundations: Interpretivism

Interpretivism is a guiding theory applied in many qualitative studies in education since it helps one understand the meanings and experiences of participants instead of only observing objective data. This approach respects personal interpretation, underlining the need to realize educational events' social and cultural background (Pervin & Mokhtar, [2022](#)). Interpretivism holds that reality is subjective and is constructed through social interactions. It adopts a relativist ontology, recognizing multiple realities shaped by culture and individual perspectives. Epistemologically, it aligns with constructivism, emphasizing knowledge as co-created between researcher and participants. This framework supports flexible, emergent research designs aimed at deep contextual understanding (Omodan, [2022](#)).

Common Qualitative Methods

Interviews

Researchers directly gather rich, detailed information from subjects and interviews are the primary method of data collection used in qualitative research. Interviews provide details on the lived experiences, viewpoints, and beliefs of teachers, students, administrators, and parents in educational environments. The study objectives define whether these interviews are structured, semi-structured, or unorganized. Semi-structured interviews often let the researcher investigate specific subjects and let participants voice themselves in their language. This method enables one to be intensely aware of educational events, including institutional challenges, teaching strategies, and learning experiences (Cirucci & Pruchniewska, [2022](#)).

Focus Groups

Direct discussions cover participants' opinions, experiences, and impressions of particular instructional subjects. This method particularly helps one understand how others see their experiences altogether. In educational research, focus groups allow students to investigate their impressions of the classroom environment, or with teachers to investigate opinions on curriculum application. Since group dynamics sometimes inspire participants to consider and change their opinions through interaction, this approach successfully presents several points of view and promotes cooperative meaning-making.

Observations

Natural educational environments, such as classrooms, playgrounds, or staff meetings, involve methodically watching and recording events, interactions, and behavior in real time. This method gives academics first-hand, contextualized knowledge of instructional strategies. Researchers can look at classroom dynamics, instructional strategies, student engagement, and teacher-student relationships using participant or non-participant observation (Cirucci & Pruchniewska, [2022](#)).

Case Studies

In-depth investigations of a single case or a few cases are invaluable for spotting trends and contextual elements that might not appear in polls or interviews in their real-life educational context. These might be policies, teachers, specific students, institutions, or programs. The aim is to investigate the case holistically and consider how several components interact to influence the learning process. Case studies help to develop theories and enable closely focused investigation of challenging issues. Sometimes, they combine several data sources, documents, observations, and interviews to present a whole case picture. Using this method, educational researchers investigate events in a specific environment (Cirucci & Pruchniewska, [2022](#)), including inclusive education, school leadership, curriculum development, or policy execution.

Strengths of Qualitative Research

Rich, In-Depth Data Collection

Among its strongest fit is qualitative research's ability to provide thorough and sophisticated insights into human experiences. From the standpoint of participants, it allows researchers to investigate complex educational events covering classroom environment, instructional strategies, and student motivation. Using methods including observations and interviews, researchers gather the interpretations people attach to their activities and surroundings (Mwita, [2022](#)).

Contextual Understanding

Qualitative research shines in examining events in their natural settings. This contextual grounding is essential in education, where sociopolitical, institutional, and interpersonal aspects must shape practices and outcomes.

It clarifies for researchers the events that occur and the reasons behind them (Mwita, [2022](#)).

Flexibility and Adaptability

The qualitative approach is, by nature, flexible and adaptable. As the study develops, research questions, methods of data collection, and theoretical frameworks may shift. That is especially helpful in dynamic environments like schools, where unanticipated events or revelations of insight typically follow (Xiong, [2022](#)).

Participant-Centered Approach

Qualitative research emphasizes the emic perspective, which is the knowledge of the world from the participant's point of view. Many points of view can be revealed in education, particularly when giving voice to teachers, students, and other stakeholders, sometimes disregarded in quantitative studies (Mwita, [2022](#)).

Theory Generation

Quantitative research often tests accepted theories, but qualitative research is ideal for developing new ideas grounded on real-world data. It helps to investigate recently emerged or understudied areas of education.

Captures Complexity and Ambiguity

Simple explanations are usually challenged in educational environments. Qualitative approaches can catch uncertainty, conflicts, and emotional depth in ways quantitative methods cannot. They let researchers examine classroom power dynamics, learning difficulties, and identity development (Xiong, [2022](#)).

Interdisciplinary and Holistic

Qualitative research is multidisciplinary and generally grounded in psychology, sociology, and anthropology. Combining emotional, social, cultural, and cognitive elements, this multidisciplinary approach supports a broader knowledge of educational concerns (Mwita, [2022](#)).

Limitations of Qualitative Research

Limited Generalizability

One of the most common criticisms of qualitative research is its limited ability to generalize findings. Because studies typically involve small, non-random samples and focus on specific contexts, the results may not be applicable to larger populations or different educational settings (Sperling, [2022](#)).

Subjectivity and Researcher Bias

Qualitative research is interpretive by nature, which means that the researcher's perspectives, values, and assumptions can influence the data collection, analysis, and interpretation. This subjectivity can sometimes lead to biased conclusions if not carefully managed through strategies like reflexivity or peer debriefing (Xiong, [2022](#)).

Time-Consuming Process

Collecting, transcribing, analyzing, and interpreting qualitative data is often a lengthy and labor-intensive process. Interviews, observations, and document analysis require substantial time, which can limit the scope or scale of the study (Sperling, [2022](#)).

Difficulty in Replication

Because qualitative research often relies on context-specific interactions and interpretations, replicating the study with the exact same results is extremely difficult. This limits the reliability and consistency typically sought in scientific research (Xiong, [2022](#)).

Data Overload and Management Challenges

Qualitative data, especially when gathered through interviews, focus groups, or field notes, can be voluminous and complex. Managing and organizing such data for meaningful analysis can be overwhelming and may lead to missed patterns or oversights (Sperling, [2022](#)).

Ethical Challenges

Given the close and often personal interaction between researchers and subjects, confidentiality, informed permission, and emotional effects are paramount. Neglect of these components might compromise the integrity and reputation of the research (Xiong, [2022](#)).

Possibility of Over Interpretation

Researchers might read too much into what subjects say or do. This over interpretation may distort the true meaning of the facts and lead to erroneous conclusions (Sperling, [2022](#)).

Fewer Acceptances in Certain Disciplines

Qualitative research is less rigorous or dependable than quantitative methods in more positivist academic traditions or policy-making circles. That could change the value or influence of qualitative results during decision-making procedures (Xiong, [2022](#)).

Examples from Educational Studies

Exploring Student Experiences in Inclusive Classrooms

A qualitative case study might examine how students with special needs see their surroundings in inclusive classrooms. In-depth interviews, observations, and teacher reflections let researchers document how classroom dynamics, teacher attitudes, and peer interactions affect student involvement and emotional well-being.

Teachers' Perceptions of Curriculum Change

Teachers' views of curriculum changes have become more apparent thanks to focus groups and semi-structured interviews. For instance, studies on secondary school teachers' "adaptation to competency-based education models" highlights imaginative ideas and implementation challenges (Aytaç, [2023](#)).

Classroom Interaction and Teacher Talk

Discourse analysis and classroom observations let researchers examine interactions between teachers and students. Particularly in language or science classrooms, qualitative research could expose how power dynamics, questioning strategies, or feedback styles influence student involvement (Aenida et al., [2022](#)).

Parental Involvement in Rural Education

Community immersion in ethnographic studies helps researchers understand the sociocultural factors affecting parental involvement in education in rural areas. These studies frequently highlight topics that

quantitative polls overlook, including literacy rates, socioeconomic limitations, or cultural standards (Mbhiza & Nkambule, [2022](#)).

Student Identity Construction in Multilingual Settings

Using narrative inquiry and life-history interviews, among other qualitative approaches, (Gayton & Fisher, [2022](#)) examined how students in bilingual or multilingual settings develop their academic and language identities.

Professional Development and Teacher Learning

Researchers have looked at, over time, how professional development programs influence classroom practices using qualitative methods. These insights help direct inclusive language education policies and practices. These studies probe how teachers absorb and apply newly acquired pedagogical knowledge using reflective journals, course observations, and interviews.

Use of Technology in Remote Learning

Qualitative investigation of teacher and student experiences uses online education systems both during and following the COVID-19 epidemic, with a focus on the challenges, adaptations, and effectiveness of digital learning tools in enhancing educational outcomes. (Camilleri & Camilleri, [2022](#)) reveals the cognitive, emotional, and logistical challenges experienced and the techniques used to maintain successful teaching and learning.

Quantitative Research in Education

Using statistical methods and numerical data, quantitative research analyses educational events. It is extensively applied for hypothesis testing, spot trend analysis, forecasting, and cause-and-effect relationship creation. It emphasizes measurement, objectivity, and the capacity to extend results over populations (Fischer et al., [2023](#)).

Definition and Characteristics

Based on the positivist paradigm, which holds that reality is objective and quantifiable, quantitative research, a method of gathering and analyzing data in numerical form, helps one understand and explain events. It usually requires big sample sizes, standardized tools (such as tests or polls), and statistical analysis (Johnson & Christensen, [2024](#)). Key characteristics include:

Use of Organized Tools, Including Tests and Questionnaires

Use of rigorous tools, including questionnaires and tests is common for quantitative research. Standardized tests, questionnaires, and polls constitute structured data-collecting tools in quantitative research. Built-in fixed-response choices for these instruments ensure homogeneity and consistency in data collecting. To reduce subjectivity and uncertainty, one wants to gather quantifiable data from a sizable population. This standardization helps to improve the validity of results (Ghanad, [2023](#)) and enables effective data processing.

Emphasizing Objectivity and Replicability

One of the basic ideas of quantitative research is the preservation of objectivity across the study. The researcher keeps a distance from the subjects, avoiding biasing or influencing the data. This approach also guarantees replicability, enabling other researchers under similar conditions to validate the conclusions. Objectivity and replicability in educational research help build scientific dependability and credibility (Ghanad, [2023](#)).

Data Presented in Numbers and Analyzed Statistically

In quantitative research, numerical data is compiled, and the outcomes are investigated using statistical instruments. That covers variance (standard deviation), central tendency (mean, median, and mode), and inferential statistics (t-tests, ANOVA, and regression analysis). Using this inquiry, researchers can identify trends, make comparisons, and ascertain the direction and strength of interactions between variables (Johnson & Christianensen, [2024](#)).

Deductive Reasoning to Test Theories or Hypotheses

Usually guiding deductive reasoning to test theories or hypotheses, a theoretical framework or hypothesis drives the collection and analysis of data for quantitative research. Deductive reasoning helps researchers determine whether the recorded data supports or contradicts the initial theory. This logical and sequential approach helps one assess the relevance of modern theories and models in educational environments (Johnson & Christian, [2024](#)).

Focus on Generalizability of Findings

The focus of quantitative research on producing results possibly utilized for larger populations is one of its main advantages. Large sample sizes and random sampling methods help researchers guarantee that the findings surpass the group under analysis. Generalizability is especially important in education since such empirical data could direct teaching strategies and policy decisions (Ghanad, [2023](#)).

Common Quantitative Methods

Surveys

In educational research, surveys are among the most widely used quantitative research methods. They employ structured questionnaires with closed-ended questions to gather data from many respondents. Surveys can assess demographic information, attitudes, beliefs, and actions. They are good at collecting data from various demographics, and statistical techniques are typically used to identify patterns, correlations, and trends (Siripipatthanakul et al., [2023](#)).

Experiments

In educational experiments, one or more independent variables are altered to observe the impact on dependent variables. This method makes it easier to establish cause-and-effect relationships. In educational settings, experiments may involve assessing the impact of a novel teaching strategy on student performance. In experimental designs, which can be either actual experiments (with random assignment) or quasi-experiments (without randomization), control and experimental groups are commonly used for comparison (Siripipatthanakul et al., [2023](#)).

Standardized Tests

These are formal assessments graded using a predetermined, uniform system. Educational research widely uses these tests to evaluate academic progress, student performance, or cognitive abilities. Because standardized tests yield norm-referenced scores and quantifiable results, they enable comparisons across groups and periods. They are crucial for evaluating educational initiatives, calculating learning results, and directing policy decisions (Siripipatthanakul et al., [2023](#)).

Strengths of Quantitative Research

Generalizability

The findings are more broadly applicable because quantitative research usually uses large sample sizes. The study's external validity is increased when conclusions about the larger group can be drawn from the data gathered from a sample. That is particularly helpful in educational research, as findings that reflect broader population trends are frequently used to inform policy decisions (Rauteda, [2025](#)).

Statistical Analysis

Advanced statistical analysis, made possible by quantitative research, can reveal trends, relationships, and patterns in data that may not be immediately obvious. Techniques such as correlation, regression, and factor analysis provide valuable insights into the relationship between variables. This data-driven approach performs exceptionally well when evaluating the effectiveness of educational interventions, instructional strategies, or policies (Mwita, [2022](#)).

Clarity and Precision

The numerical presentation of quantitative data makes research findings clear and precise. These results can be displayed in clear graphs, charts, and tables, making complex data more accessible and understandable. That aids stakeholders, legislators, and educators in making well-informed decisions based on reliable numerical data (Mwita, [2022](#)).

Ability to Test Hypotheses

Quantitative research excels at testing hypotheses. Using deductive reasoning, researchers can formulate specific hypotheses based on theories and test them with empirical data. That facilitates developing new, empirically supported educational models or interventions and confirming or debunking preexisting theories (Rauteda, [2025](#)).

Limitations of Quantitative Research

Lack of Contextual Depth

One of the primary limitations of quantitative research is its inability to provide deep, contextual insights. Quantitative approaches often overlook the complexity of social interactions, individual differences in educational

settings, and the human experience despite focusing on quantifiable factors. This could lead to a superficial understanding of the phenomenon being studied, leaving out important qualitative components essential to education, like motivations, emotions, and perceptions (Mwita, [2022](#)).

Inflexibility of Structured Tools

Among the disciplined instruments used in quantitative research are surveys, tests, and questionnaires with great adaptability. These instruments give consistency but could make recording the whole spectrum of responses more difficult. Should participants be driven to fit into predefined categories, this could limit their capacity to investigate fresh or unexpected angles of the research question. This rigidity may cause notable underrepresentation or overlooking data (Rauteda, [2025](#)).

Overemphasis on Numbers

Sometimes quantitative research considers numerical data, ignoring the complexity and richness of educational environments. Important qualitative elements, including student engagement, teacher-student relationships, and classroom dynamics, may not be sufficiently highlighted or investigated even if they are relevant in terms of knowledge of educational processes and outcomes.

Limited Understanding of Causality

Though they detect trends and correlations, quantitative methods usually cannot show causal relationships. Statistical models are standard in quantitative research to test hypotheses; nevertheless, not all variables that could influence the outcomes are considered. Ignoring contextual elements in quantitative research makes it difficult to find whether the reported relationships in (Rauteda, [2025](#)) are causal or coincidental.

Ethical Issues

Quantitative research may encounter ethical concerns about participant privacy and consent, particularly in large-scale studies. Structured tests or surveys may not always be able to explain the background or goal of the research sufficiently; thus, complex, informed consent may not always be possible. Moreover, participant responses could sometimes be oversimplified or generalized in ways that do not reflect their particular situation fairly, perhaps resulting in misrepresentation (Mwita, [2022](#)).

Dependency on Large Sample Sizes

Usually, quantitative research recommends high sample sizes to ensure statistical power and generalizability. However, data collecting from many participants can logistically be complex, time-consuming, and resource-intensive. Furthermore, even in educational settings with specific local conditions, big sample sizes could not fairly depict the varied experiences of people inside more concentrated smaller groups (Rauteda, [2025](#)).

Potential for Oversimplification

By focusing on a limited number of variables or distilling difficult educational events to just numbers, quantitative approaches may oversimplify complex problems. This might lead to misinterpretation or inadequate conclusions since it ignores the interaction of several social, cultural, and personal elements affecting the educational process (Rauteda, [2025](#)).

Examples from Educational Studies

Large-Scale Standardized Testing Studies

One common form of quantitative education research uses standardized testing to evaluate student performance across many institutions, areas, or nations. Large-scale educational outcomes are evaluated by research on the efficacy of standardized tests such as the SAT or PISA (Programme for International Student Assessment). These studies use statistical analyses to examine educational systems, seek trends, and contrast nations. Usually analyzed quantitatively, the data gathered from these extensive tests reveals relationships between student performance and elements like socioeconomic background, resource accessibility, or teacher quality (Evans & Yuan, [2022](#)).

Survey-Based Studies on Teacher Satisfaction

Survey-based studies on job performance, burnout, and teacher satisfaction are often gathered using quantitative research. Researchers could use surveys to measure teachers' job satisfaction and statistically assess the outcomes to find variables influencing their morale, such as workload, student behavior, or administrative support. These studies can direct educational policies aiming at improving working conditions for teachers and help to highlight significant elements influencing teacher retention, (Bozdağ et al., [2023](#)).

Experimental Studies on Teaching Methods

Using quantitative research, experimental studies on instructional strategies or philosophies compare. For instance, a study might assess students' academic performance based on pre-and post-test results following random assignments of students to either interactive, hands-on learning or conventional lecture-based instruction. Stated performance variations will be statistically investigated to find the most successful teaching approach for learning outcomes. This study offers objective data on the success of several teaching strategies (Bozdağ et al., [2023](#)).

Longitudinal Studies on Student Achievement

Longitudinal studies on student performance track students across an extended period. These studies frequently gather data on student performance over several years and often use statistical methods to investigate the effects of many elements, including socioeconomic level, parent involvement, or school resources. Research might track the academic performance of a cohort of elementary school students to ascertain how early educational interventions affect long-term academic outcomes (Saqr et al., [2023](#)).

Meta-Analysis of Educational Interventions

Meta-analysis of educational interventions is a method of quantitative research whereby data from many studies are combined to identify general trends and patterns. For example, a meta-analysis might gather data on the effectiveness of reading programs in elementary school from many studies. Using statistical data analysis, researchers can ascertain whether a given intervention is routinely successful and under what conditions. Meta-analysis aids in the more all-encompassing and generally relevant evaluation of the success of policy or educational projects (Ng et al., [2022](#)).

Surveys on Student Engagement and Motivation

Quantitative studies on student involvement and motivation in classroom settings often evaluate these elements. To find their class participation, a study might, for instance, poll high school students and look at classroom dynamics, curriculum development, and teacher-student relationships. Using statistical analysis of the survey results, schools can design strategies to increase student motivation by spotting trends and links between academic performance and involvement.

Analysis of School Climate Using Questionnaires

Another example is using questionnaires to measure school climate the overall atmosphere and environment of a school. Researchers may distribute surveys to students, teachers, and administrators to assess perceptions of safety, discipline, and relationships within the school. The data is then statistically analyzed to identify factors that contribute to a positive or negative school climate and to suggest areas for improvement (Bochaver et al., [2022](#)).

Comparison between Qualitative and Quantitative Methods

Table 1 highlights the fundamental differences and similarities between qualitative and quantitative research methods as summarized in Figure 1.

Figure 1

Venn Diagram: Qualitative and Quantitative Methods

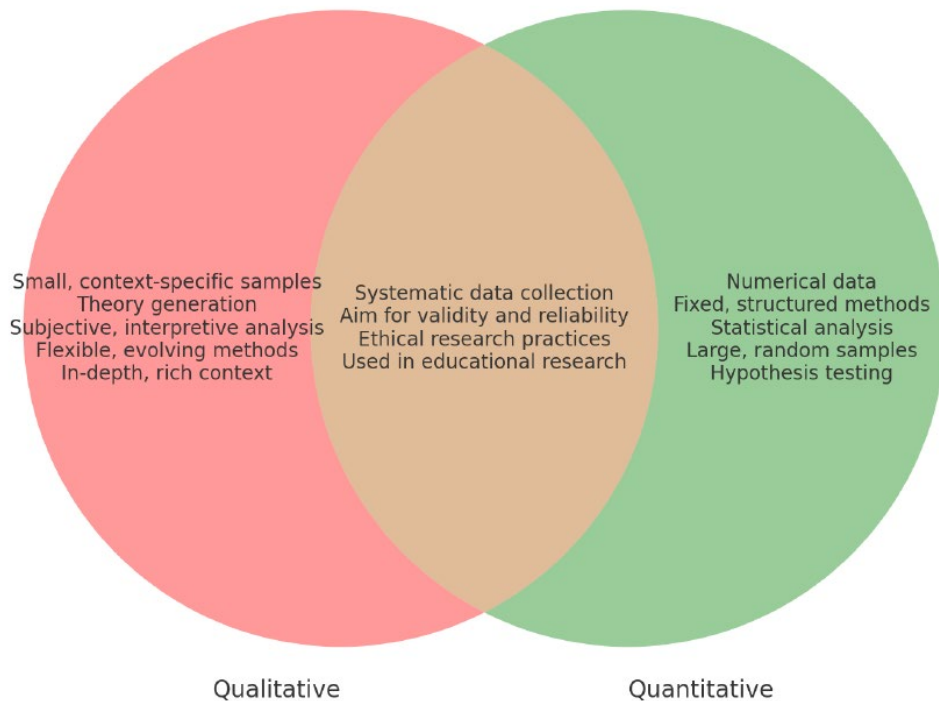


Table 2*Comparison between Qualitative and Quantitative Methods*

Aspect	Qualitative Research	Quantitative Research
Definition	Involves non-numerical data collection and analysis to understand human experiences in-depth.	Involves numerical data collection and analysis to identify patterns and test hypotheses.
Data Collection Methods	Interviews, observations, case studies, focus groups, and document analysis.	Surveys, questionnaires, tests, and experiments.
Nature of Data	Descriptive, detailed, and narrative.	Numerical, statistical, and objective.
Sample Size	Small, non-random, and context-specific samples.	Large, random, and representative samples.
Purpose	Explore and understand complex phenomena, generate theories.	Test hypotheses, measure variables, and establish cause-effect relationships.
Data Analysis	Thematic, interpretive, and inductive (seeks patterns and meanings).	Statistical analysis (descriptive and inferential statistics).
Flexibility	Highly flexible; research questions and methods evolve.	Rigid; research questions and methods are predefined and fixed.
Strengths	Provides in-depth, context-rich insights, captures complexity, and can generate new theories.	Provides precise, reliable data, generalizable results, and tests theories.
Weaknesses	Limited generalizability, subjective bias, time-consuming, and ethical challenges.	Lack of contextual depth, limited understanding of human experiences, dependency on large sample sizes.

Aspect	Qualitative Research	Quantitative Research
Contextual Understanding	Strong understanding of context and environment (e.g., classroom dynamics).	Limited contextual understanding, focusing on numerical patterns.
Hypothesis Testing	Typically generates new theories or insights.	Tests predefined hypotheses and models.
Generalizability	Limited due to small and specific sample sizes.	High, results can be generalized to larger populations.
Role of Researcher	Researcher is actively involved; interpretations may reflect researcher's perspective.	Researcher remains detached to maintain objectivity.
Ethical Concerns	Ethical concerns around confidentiality, informed consent, and emotional impacts.	Ethical concerns mainly around privacy, consent, and anonymity.
Examples	Case studies of teachers' perceptions, ethnographic studies in classrooms.	Standardized tests, surveys on teacher satisfaction, experimental studies on teaching methods.

Table 3 shows the data collection techniques used in Qualitative and Quantitative research (Wallwey & Kajfez, [2023](#)), along with a brief description of each.

Table 3

Key Differences of Data Collection Techniques

Technique	Qualitative Research	Quantitative Research
Data Type	Non-numerical (e.g., words, images, narratives)	Numerical (e.g., numbers, frequencies, statistics)
Methodology	Flexible, often evolving, subjective	Structured, fixed, objective
Sample Size	Small, non-random samples	Large, random samples

Technique	Qualitative Research	Quantitative Research
Focus	Context, depth, and meaning	Measurement, comparison, and generalization
Data Collection Tools	Interviews, focus groups, ethnography, case studies	Surveys, tests, questionnaires, experiments
Goal	Understand the lived experiences and meanings	Test hypotheses, measure variables, and establish causality

Table 4 shows a summary of common data analysis procedures for both Qualitative and Quantitative research (Li & Zhang, [2022](#)). These procedures guide the analysis of data in both qualitative and quantitative research and can be adapted depending on the specific research question, methodology, and data type.

Table 4

Comparison of Qualitative and Quantitative Data Analysis Procedures

Aspect	Qualitative Analysis	Quantitative Analysis
Data Type	Non-numerical (words, images, narratives)	Numerical (numbers, statistical data)
Goal	To explore meaning, experiences, and patterns	To measure variables, establish cause-effect relationships
Approach	Inductive (emerges from data)	Deductive (tests existing hypotheses)
Tools	Coding, theme identification, narrative analysis	Statistical tests, regression models, charts, graphs
Procedure	Data collection and analysis are intertwined	Analysis follows after data collection
Interpretation	Flexible and subjective, seeking deeper meanings	Objective, focused on statistical significance

Validity and Reliability are two essential concepts that assess the quality and trustworthiness of research findings (Abbasi et al., [2024](#)). Below is an explanation of both concepts in relation to qualitative and quantitative research shows in Table 5.

Table 5

Comparison of Validity and Reliability in Qualitative vs. Quantitative Research

Aspect	Quantitative Research	Qualitative Research
Validity	Strong emphasis on external and construct validity. Research tools (tests, surveys) must measure the variables accurately and be generalizable.	Emphasis on credibility, transferability, and dependability. Focus is on how well the study reflects participants' realities and experiences.
Reliability	Emphasizes internal consistency, test-retest reliability, and inter-rater reliability. Tools need to yield consistent results across time and researchers.	Emphasizes dependability and conformability. Research findings need to be consistent, but also flexible enough to account for changing contexts.
Approach	Uses standardized instruments and statistical measures to ensure results are valid and reliable.	Involves flexible data collection and interpretation, ensuring that findings can be consistently interpreted across different settings and contexts.

Both qualitative and quantitative research methods have distinct strengths and applications in educational settings (Pregoner, [2024](#)). Depending on the research questions, objectives, and context, one may be more suitable than the other, or a combination of both approaches (mixed-methods research) may be used. Table 6 is the breakdown of the suitability of both approaches for educational research.

Table 6

Comparison of Qualitative and Quantitative Research in Educational Settings

Aspect	Qualitative Research	Quantitative Research
Purpose	To explore and understand experiences, perceptions, and contextual factors.	To measure and analyze relationships, patterns, and causal effects.

Aspect	Qualitative Research	Quantitative Research
Focus	In-depth exploration of individual experiences and complex social dynamics.	Gathering objective data to assess trends, correlations, and generalizable results.
Data Collection	Interviews, focus groups, observations, and case studies.	Surveys, tests, questionnaires, and standardized assessments.
Data Type	Descriptive, narrative, and subjective data.	Numerical data for statistical analysis.
Analysis	Thematic analysis, content analysis, and coding of data.	Statistical analysis, regression models, and hypothesis testing.
Timeframe	Flexible, can be long-term to capture evolving phenomena.	Often shorter, focusing on collecting data from larger populations at a specific point in time.
Generalizability	Focused on specific contexts, results may not always be generalizable.	Aims for generalization to larger populations using random sampling techniques.
Strengths	Provides rich, detailed insights, can explore contextual factors.	Replicability, large sample sizes, and ability to test hypotheses and theories.
Limitations	Findings may not be applicable to broader populations due to small sample sizes.	May overlook the human experience and complex social dynamics due to its focus on numbers.

Ethical considerations are critical in all stages of educational research, from planning and data collection to analysis and reporting (Laryeafio & Ogbewe, [2023](#)). Researchers must ensure that their research complies with ethical standards to protect participants' rights and well-being. Below are the key ethical considerations for both qualitative and quantitative research methods show in Table 7.

Table 7

Comparison of Ethical Considerations in Qualitative and Quantitative research

Ethical Consideration	Qualitative Research	Quantitative Research
Informed Consent	Participants must be fully informed about the research, its purpose, and potential risks.	Similar to qualitative, participants must be fully informed about the study and its aims.
Confidentiality and Anonymity	Researcher ensures that participants' identities are protected and data is anonymized.	Ensures confidentiality and anonymizes data, particularly in large-scale studies.
Right to Withdraw	Participants can withdraw at any time without consequences.	Participants have the right to withdraw at any stage, without facing any penalties.
Non-Harmful Interaction	Researchers ensure no emotional, social, or psychological harm to participants.	Ensures no harm through surveys or experiments; sensitive topics must be handled with care.
Transparency and Integrity	Data should be honestly represented, without misrepresentation or selective reporting.	Researchers must honestly report data without manipulation, maintaining accuracy.
Avoiding Bias	Researchers must minimize personal biases in data collection and interpretation.	Efforts must be made to eliminate bias in sampling, survey design, and data analysis.
Protection of Vulnerable Populations	Extra care is needed when working with vulnerable groups to avoid exploitation.	Researchers must take special care when working with vulnerable populations.
Cultural Sensitivity	Methods must be adapted to respect cultural norms and sensitivities.	Researchers must ensure surveys and experiments are culturally appropriate and sensitive.

Ethical Consideration	Qualitative Research	Quantitative Research
Ethical Use of Results	Findings must be reported responsibly, and not misused or misrepresented.	Results must be used ethically, without misrepresentation to influence policy.
Data Integrity and Accuracy	Data should be accurately transcribed and analyzed, avoiding distortion.	Quantitative data must be kept intact and accurately analyzed without manipulation.

Mixed-Methods Approach in Education

A mixed-methods approach integrates both qualitative and quantitative research methods in a single study, allowing researchers to take advantage of the strengths of both approaches. By combining the two, researchers can gain a comprehensive understanding of an educational phenomenon (Pregoner, [2024](#)).

Benefits of a Mixed-Methods Approach

Comprehensive Understanding

It provides a fuller understanding of research questions by using both numeric data (quantitative) and detailed descriptions (qualitative). Qualitative data offers deeper insights into context, while quantitative data provides statistical validation (Wallwey & Kajfez, [2023](#)).

Triangulation

Using a comparison and contrast between qualitative and quantitative findings, researchers can validate results across several methods, enhancing the validity of the research conclusions.

Enhancing Generalizability and Depth

Although quantitative approaches offer generally applicable data, qualitative approaches deepen that generalization by clarifying "why" or "how" particular results occurred (Wallwey & Kajfez, [2023](#)).

Flexibility

This method can be customized to fit the particular needs of the research, including combining both approaches inside several phases of the study (Wallwey & Kajfez, [2023](#)).

Challenges of a Mixed-Methods Approach

Complexity in Design and Implementation

Designing research combining qualitative and quantitative methods requires careful planning since complexity in design and implementation calls for both. The integration has to make sense of the research questions and be carried out without generating methodological conflict (Zhou & Wu, [2022](#)).

Data Integration

Gathering qualitative and quantitative data presents one of the main challenges. The researcher must ensure that, using a coherent interpretation of the data, the results of every technique complement one another.

Resource and Time Intensive

Mixed-methods studies can be resource-intensive, requiring more time, effort, and often financial investment to gather and analyze both qualitative and quantitative data (Wallwey & Kajfez, [2023](#)).

Expertise Required

Researchers need expertise in both qualitative and quantitative methods, which can sometimes be a limitation for those with proficiency in only one method (Zhou & Wu, [2022](#)).

Uses of a Mixed-Methods Approach

When the Research Questions Are Complex

If the research questions require both statistical evidence and an understanding of personal experiences or contexts, a mixed-methods approach is ideal. For example, exploring student engagement may involve quantitative measures (e.g., surveys) and qualitative insights (e.g., interviews or observations) to understand the factors influencing engagement.

To Strengthen and Complement Findings

When researchers want to validate their findings, mixed methods provide opportunities for triangulation, where the quantitative results can be explored further through qualitative methods to understand underlying reasons (Wallwey & Kajfez, [2023](#)).

When One Method Alone Isn't Sufficient

If qualitative methods alone don't provide enough generalizable evidence or if quantitative methods fail to explain the underlying causes behind trends, a mixed-methods approach bridges these gaps.

Exploratory and Explanatory Stages

In exploratory studies, qualitative methods might first be used to identify key variables or themes, followed by quantitative methods to measure the prevalence or impact of those themes on a larger scale. In explanatory studies, quantitative methods may be used initially to establish patterns or relationships, followed by qualitative methods to explain why those patterns exist.

Examples of Mixed-Methods Studies in Education

Teacher Professional Development

A study might use surveys (quantitative) to assess teachers' perceptions of a new professional development program and interviews (qualitative) to understand the reasons behind their attitudes.

Student Achievement

Researchers could collect test scores (quantitative) to measure achievement and then conduct focus groups (qualitative) to explore the factors influencing student performance (Alshahrani & Abu-Alghayth, [2023](#)).

Classroom Technology Use

A study could measure the extent of technology integration in classrooms (quantitative) and then interview teachers and students (qualitative) to understand the impact of technology on teaching and learning.

Discussion and Implications for Educational Researchers

The outcome of an educational study primarily relies on the choice of research technique. As discussed in above sections, the selected methods should coincide with the research objectives and questions to ensure the results' validity and relevance (Mulisa, [2022](#)). Every qualitative, quantitative, and mixed-methods technique has distinct advantages; knowing when and why to use each is crucial. The nature of the phenomena under study, the tools available, and the degree of detail required to address the research question all impact educational researchers' method choices (see Table 2).

Despite their limited generalizability, qualitative methods provide rich, contextually grounded insights that help researchers grasp personal experiences, motivations, and complex educational dynamics. In contrast, while offering statistical rigor and broad generalizability, quantitative approaches may overlook important contextual and nuanced elements influencing general trends and patterns (Emon, [2024](#)). This finding supports the pragmatic approach highlighted earlier, encouraging researchers to select methods that align with their research goals and paradigms.

Combining the advantages of both approaches, mixed-methods research, as explained earlier, presents a more comprehensive picture of educational phenomena. By integrating qualitative depth with quantitative breadth, mixed methods allow for triangulation and validation of findings, enhancing both the richness and reliability of conclusions (Table 6). Researchers should ensure that the chosen technique supports their theoretical and pragmatic goals since method selection directly shapes how results are presented and interpreted (Taherdoost, [2022](#)). The chosen research technique directly affects the outcome of a project as well as its interpretation. Though they lack generalizability, qualitative approaches give rich, context-rich insights that help one to grasp personal experiences, motivations, and impressions. Conversely, quantitative approaches could overlook the complex elements influencing general trends and patterns while providing statistical proof stressing them (Emon, [2024](#)). Combining the advantages of both approaches helps mixed-methods research to present the whole picture. Researchers should ensure that the chosen technique supports their theoretical and pragmatic goals since they know how their approach shapes the results' presentation and analysis (Thompson et al., [2022](#)).

Firstly, new researchers should be familiar with many research techniques and their advantages and drawbacks. They should pick the settings where each would be most appropriate and acquire qualitative and quantitative methods. Starting with well-stated, unambiguous research questions is essential since they will guide the choice of technique. New researchers should also be willing to use a mixed-methods approach when appropriate, since this will help offer more awareness of educational issues (Sharma et al., [2023](#)). Moreover, handling unforeseen obstacles in the research depends on adaptation and flexibility since it involves developing and changing methods. Peer reviews and advice from seasoned mentors can help new researchers improve their methodology and avoid typical errors.

Conclusion

In conclusion, qualitative and quantitative research approaches provide a perceptive analysis of educational events, each with unique uses, addressing different learning curve aspects. Analyzing complex, context-specific problems and fully understanding participant experiences and points of view calls for qualitative approaches. Researching prejudice in the meantime can influence results and occasionally is not generalizable. Conversely, even if quantitative approaches offer a more objective, generalizable perspective of educational trends and patterns, they lack the depth required to grasp the complexity of particular experiences. Combining two strategies, mixed-methods research allows researchers to leverage one another's strengths, thus providing a whole picture of instructional activities. Depending on the research question, the data type, and the expected results, educational researchers have to pick their techniques very deliberately. New researchers are urged to be adaptable in their approach, have a strong grasp of qualitative and quantitative techniques, and ask for advice from seasoned mentors. This will help them reassure others that their research provides perceptive analysis to guide educational policy and practice.

Conflict of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

Data Availability Statement

Data availability is not applicable as no new data was created.

Funding Details

No funding has been received for this research.

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