

**QUANTITATIVE, QUALITATIVE, AND MIXED METHODS APPROACHES IN
SCIENTIFIC RESEARCH: CONCEPTUAL FOUNDATIONS, DIFFERENCES, AND
APPLICATIONS**

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Abstract

The findings presented allow for an understanding of the relevance of research approaches as guiding axes of the scientific process. Each approach quantitative, qualitative, and mixed responds to distinct epistemological assumptions that shape how reality is observed, analyzed, and interpreted. While the quantitative approach prioritizes objective measurement, control, and hypothesis testing through numerical data, the qualitative approach focuses on the deep interpretation of meanings, experiences, and sociocultural contexts. The mixed approach, in turn, integrates both perspectives, recognizing the complexity of social phenomena and enabling broader and complementary analyses. Thus, the selection of an approach depends directly on the research problem, the type of question, and the required epistemological coherence. Understanding these foundations allows researchers to make coherent methodological decisions and construct consistent, rigorous knowledge aligned with the nature of the phenomenon studied.

Keywords: research approaches: qualitative, quantitative, mixed

1. Introduction

The study of research approaches constitutes an essential component of scientific practice, as it guides methodological decisions that determine how a phenomenon will be observed, analyzed, and interpreted. In the academic field, the approach functions as a theoretical–methodological guide that links the formulation of the problem with the procedures for data collection and analysis, ensuring internal coherence throughout the research process (Hernández et al., 2007; 2018). This perspective is not limited to the selection of techniques; rather, it expresses an epistemological and ontological stance regarding the nature of reality and how it can be known.

The quantitative approach, grounded in the positivist paradigm, assumes that reality is objective and measurable. Its purpose is to explain phenomena through numerical data and statistical analysis, enabling the identification of patterns, causal relationships, and

generalizable regularities. In contrast, the qualitative approach emerges from the interpretive tradition, focusing on the deep understanding of meanings, experiences, and symbolic constructions. This approach prioritizes subjectivity, context, and descriptive richness to access the internal logics that guide social practices.

The mixed approach represents an integrative alternative that allows for a multidimensional understanding of the complexity of social phenomena. By combining quantitative and qualitative techniques, it offers a broader and more robust perspective, overcoming the dichotomy between objectivity and subjectivity. Its relevance lies in its ability to address research questions that require simultaneous measurement, interpretation, and data triangulation.

In this context, understanding research approaches not only enables the selection of appropriate methodological strategies but also strengthens scientific rigor and facilitates the construction of relevant and situated knowledge. This introduction therefore establishes the conceptual foundations that support the subsequent analysis of the results.

2. Methodology

This research is framed within the interpretive paradigm, which assumes that social reality is a symbolic construction created by individuals based on their experiences, meanings, and practices. From this perspective, knowledge is not discovered through objective measurement but interpreted through the narratives, discourses, and contexts that shape social life. The researcher therefore adopts a reflective and situated stance, recognizing that their understanding of the phenomenon emerges through dialogue with the actors involved.

In coherence with this paradigm, a qualitative approach is adopted, aimed at exploring in depth the meanings, perceptions, and symbolic constructions that participants attribute to the phenomenon under study [3]–[4]. This approach allows access to the complexity of the object of study through flexible techniques that encourage the spontaneous expression of participants and the contextual interpretation of their experiences. The open and emergent nature of qualitative research makes it possible to adjust questions, categories, and analytical strategies as fieldwork and the researcher's reflection progress.

Hermeneutics is employed as the method of analysis, understood as the systematic interpretation of discourses, texts, and narratives with the purpose of identifying meanings, tensions, patterns, and underlying structures. Hermeneutics does not aim to describe facts in quantifiable terms but to understand the internal logics that guide participants' actions and the meanings they construct. To achieve this, a circular interpretive process is developed, involving reading, coding, comparison, categorization, and constant reinterpretation of the empirical material.

Taken together, the methodology adopted allows the phenomenon to be approached from a comprehensive perspective, one that is sensitive to subjectivity and to the sociocultural contexts in which knowledge is produced.

3. Results

The section on conceptual foundations presents the notion of the research approach as the axis that guides the researcher's orientation toward the object of study. Beyond a simple technical choice, the approach constitutes a methodological perspective articulated with a specific epistemological paradigm, on which the type of information to be collected, the analytical strategies, and the way data are interpreted depend. In this sense, the section examines how the approach coherently organizes the research process, links the formulation of the problem with methodological decisions, and enables a rigorous, systematic, and coherent construction of scientific knowledge.

3.1. Conceptual Foundations

The research approach refers to the way in which the researcher structures their orientation toward the object of study, defining how it will be observed, analyzed, and understood. Essentially, it is the methodological perspective from which the phenomenon of interest is addressed, which depends directly on the type of problem formulated and on the nature of the question or hypothesis posed [2].

Within the field of scientific research, the approach functions as a theoretical–methodological guide that allows the research process to be organized coherently. It not only determines the type of information to be collected but also guides the analytical strategies and the ways in which the obtained data will be interpreted. Consequently, the approach acts as a logical structure that links the problem formulation with methodological decisions, thus facilitating a rigorous and systematic construction of knowledge [5].

Likewise, the approach can be understood as the general methodological path adopted by the researcher in accordance with the epistemological paradigm that guides their study. This methodological choice is not arbitrary; rather, it must correspond with the epistemological and ontological assumptions of the selected paradigm, thereby ensuring the internal coherence of the research. In this way, the approach directly influences the study design, the collection and analysis of data, and the manner in which conclusions are articulated in relation to the phenomenon under investigation [1]–[2]–[5].

3.2. Types of Research Approaches

There are three main approaches widely recognized in the scientific literature for conducting research: the quantitative approach, the qualitative approach, and the mixed approach. Each of these responds to different epistemological, methodological, and technical conceptions, and their selection depends on the type of research problem, the objectives established, and the paradigm from which the phenomenon is addressed.

3.2.1. Quantitative Approach

From an epistemological standpoint, the quantitative approach is grounded in the positivist paradigm, which holds that reality is objective, measurable, and accessible through empirical observation. Under this perspective, it is assumed that phenomena can be quantified through standardized and validated instruments, making it possible to obtain numerical data that are

subsequently subjected to rigorous statistical analysis [2]. Its primary purpose is to explain, predict, and test hypotheses based on solid empirical evidence, allowing the identification of patterns, correlations, and causal relationships between variables. For this reason, it is widely used in fields such as epidemiology, the natural sciences, economics, and experimental psychology, where objectivity and replicability of findings are required [6]–[7]–[9]–[10]–[11]. Leading methodological specialists (Dzul [6]; Hernández et al. [2]; APA Standards [7]) point out a series of distinctive features that characterize this approach, among which the following stand out:

- ✓ Clear delimitation of the object of study: It focuses on specific, well-defined problems, allowing for the establishment of concrete objectives and measurable variables.
- ✓ Prior formulation of hypotheses: Before collecting data, the researcher establishes hypotheses that guide the process and can be verified empirically.
- ✓ Rigorous measurement: Information is gathered through precise measurement of quantities, frequencies, or dimensions of the phenomenon, ensuring objectivity and comparability.
- ✓ Use of standardized instruments: It employs previously validated tools or those designed based on recognized methodological criteria, ensuring the reliability and validity of the data.
- ✓ Statistical analysis of results: Data are organized and examined according to the hypotheses, using categories and statistical tests that facilitate interpretation.
- ✓ Control of errors and external variables: Efforts are made to minimize uncertainty and systematic or random errors to strengthen the study's internal validity.
- ✓ Identification of causal relationships: It seeks to establish causal links between variables, beyond mere correlations.
- ✓ Search for generalizable regularities: By empirically verifying theories, it aims to identify patterns that can be generalized to similar contexts.
- ✓ Deductive reasoning: The process begins with theories or general assumptions that are tested against data, allowing for the refinement or development of theoretical explanations.

In summary, the quantitative approach is based on an objective view of knowledge, supported by measurable, reproducible, and verifiable evidence. Its methodological rigor and its ability to identify consistent patterns make it an essential tool in studies that require precision, control, and generalization [6].

3.2.2. Qualitative Approach

From the perspective of the interpretive paradigm, the qualitative approach aims to investigate and deeply understand meanings, subjective experiences, symbolic constructions, and social processes as they are lived and expressed by actors within their own contexts. Unlike the quantitative approach, its purpose is not to measure or generalize phenomena but to interpret

them in all their complexity, considering the cultural, linguistic, and situational specificities of each reality studied. To achieve this, it employs methodological strategies such as in-depth interviews, participant observation, discourse analysis, life histories, and case studies, which enable a detailed and contextualized understanding of social events. This approach is widely used in fields such as sociology, anthropology, education, social psychology, and community health, where the value of subjective perspectives and constructed meanings is recognized [2]–[4]–[6]–[7]–[9]–[10]–[11].

According to key methodological references (Dzul [6]; Hernández et al. [2]), the fundamental characteristics of the qualitative approach can be described as follows:

- ✓ Broad and flexible problem formulation: Unlike quantitative studies, which require precise delimitation from the outset, qualitative research begins with a broad and adaptable problem that allows objectives and questions to be adjusted as fieldwork progresses.
- ✓ Dynamic research questions: Questions are not definitively established at the beginning; instead, they emerge and are refined progressively in response to preliminary findings, giving the research process an exploratory and open character.
- ✓ Predominance of inductive reasoning: The qualitative approach is grounded in logic that moves from particular data, narratives, and observations to theoretical interpretations. Its purpose is not to test prior hypotheses but to generate meaningful understandings based on participants' experiences.
- ✓ Absence of initial hypotheses: Instead of verifying predetermined propositions, this approach seeks to identify categories, meanings, and patterns that emerge during the study, reflecting its flexible and adaptive nature.
- ✓ Open and non-standardized data collection techniques: Data collection does not follow rigid protocols. Techniques such as open interviews, focus groups, or unstructured observations are used to facilitate spontaneous expression.
- ✓ Centrality of subjectivity: The qualitative approach assigns a key role to individuals' perceptions, emotions, narratives, and experiences. Although subjectivity is emphasized, interpretations are based on systematic methods that ensure analytical coherence and rigor.
- ✓ Methodological diversity: Multiple data collection methods—interviews, observation, group discussions, documentary review—are used depending on the context and object of study.
- ✓ Holistic understanding of reality: This approach analyzes phenomena as a whole, considering their interrelationships and avoiding fragmentation, since reality is understood as a socially constructed totality.
- ✓ Non-intervention in context: Reality is observed as it naturally occurs, without manipulation of variables, respecting the spontaneity of social processes.

✓ Interpretive and subjective nature of results: Findings are constructed through interpretation, making them difficult to replicate and generalize; however, their value lies in the ethical, contextual, and reflective depth they contribute to knowledge.

In summary, the qualitative approach is an essential methodological pathway for the in-depth understanding of social realities, grounded in a flexible, sensitive, and contextualized perspective of knowledge [2]–[4]–[6]–[7].

3.2.3. Mixed Approach

The mixed approach can be understood as a methodological strategy that complementarily combines the foundations, procedures, and purposes of both quantitative and qualitative approaches, with the aim of achieving a broader, deeper, and more enriched understanding of the phenomena under study. It is based on the recognition that reality is intrinsically complex and composed of multiple dimensions, which makes it impossible to adequately address it from a single epistemological or methodological perspective [2]–[4]. This integrative proposal makes it possible to unite the objective measurement of variables with the interpretation of meanings and human experiences, articulating numerical data with narratives and symbolic constructions. Under this logic, the mixed approach is not reduced to the sum of two methods, but constitutes a coherent research structure designed to address questions that require different levels of analysis [2]–[4]–[6]–[7].

Methodological experts agree that this approach offers significant advantages when the purpose of the study involves not only identifying causal relationships, but also understanding the meanings that individuals attribute to their practices and contexts [8] 2020). In this way, the mixed approach overcomes the classical dichotomy between objectivity and subjectivity, between generalizable explanations and singular experiences, as well as between the deductive and inductive processes characteristic of each research tradition.

Among the most relevant features of the mixed approach are the following:

✓ **Integration of perspectives:** This approach combines the quantitative logic—characterized by objectivity, generalization, and statistical procedures—with the qualitative logic, oriented toward understanding meanings from specific and subjective contexts. This combination allows for multidimensional analysis of phenomena, enriches the interpretation of results, and minimizes biases that may arise from relying on a single approach.

✓ **Flexible and integrated methodological designs:** Mixed studies are structured through designs that coherently link qualitative and quantitative phases. These phases may be executed sequentially, simultaneously, or under a transformative model guided by a specific theoretical or social framework, offering versatility to address diverse research needs.

✓ **Triangulation of information:** By employing different techniques and sources of data collection, this approach allows cross-verification of information, strengthening the validity and reliability of results and providing a more comprehensive and robust view of the phenomenon analyzed.

✓ **Depth and breadth of analysis:** The combination of methods allows identification of general patterns through statistical analysis as well as particular meanings through qualitative interpretation. This duality contributes to a richer and more detailed understanding of the processes studied.

✓ **Adaptation to practical contexts:** The mixed approach is particularly relevant in applied research, intervention programs, or educational and social evaluations, where it is necessary to examine both measurable data and participants' subjective experiences.

✓ **High methodological demands:** Despite its advantages, this approach requires strong research competence, since it involves mastering different paradigms, techniques of data collection and analysis, and justifying the integration of both perspectives.

In conclusion, the mixed approach constitutes an effective methodological response to the growing need to understand complex social phenomena, combining the empirical rigor of quantitative analysis with the interpretive richness of qualitative inquiry. Its rigorous application enables the production of comprehensive knowledge useful for both theory and practice [2]–[4]–[6]–[7]–[12]–[13].

3.3. Differences Between Qualitative, Quantitative, and Mixed Approaches

Epistemological and methodological diversity. The differences among qualitative, quantitative, and mixed approaches reflect the diversity of paradigms that underpin scientific production. While the quantitative approach relies on an objective and measurable view of reality, the qualitative approach is based on an interpretative and contextual understanding. The mixed approach, meanwhile, proposes an integration that acknowledges the complexity of social phenomena by articulating numerical and narrative dimensions within a single research design.

Differences in objectives and research logic. Each approach responds to distinct purposes: the quantitative approach seeks to explain and predict phenomena through testable hypotheses; the qualitative approach focuses on interpreting subjective meanings from the perspective of social actors; and the mixed approach aims to comprehensively understand phenomena by combining both processes. These differing purposes also determine the types of research questions, analytical methods, and forms of presenting results.

Contrast in techniques and types of data. The quantitative approach privileges the collection of structured data through standardized instruments (such as surveys or tests), while the qualitative approach uses open and flexible tools (such as interviews or discourse analysis). The mixed approach, by combining both types of data, requires more complex methodological planning and solid epistemological justification.

Different forms of validating knowledge. In the quantitative approach, validity is associated with reliability, replicability, and statistical generalization. In the qualitative approach, validity is linked to credibility, internal coherence, and interpretative depth. The mixed approach seeks triangulation and complementarity, integrating validation criteria from both approaches to strengthen the robustness of findings.

Implications for the role of the researcher. In the quantitative approach, the researcher assumes an objective and distant role; in the qualitative approach, the researcher becomes an active part of the process, interpreting from a situated and reflexive standpoint. The mixed approach requires skills in both domains, along with a critical and flexible attitude capable of navigating different methodological logics.

Differential applicability depending on the object of study. The selection of an approach should not be arbitrary but based on the nature of the research problem. If the objective is to establish causal relationships and obtain generalizable results, the quantitative approach is most appropriate. If the goal is to explore meanings or understand cultural or subjective dynamics, the qualitative approach is more suitable. For complex research questions that require simultaneous explanation and interpretation, the mixed approach represents a powerful integrative alternative.

3.4. Use and Application of the Approaches

Quantitative approach: This approach is primarily used to measure variables, test hypotheses, and examine statistical relationships between phenomena. It is particularly relevant in studies that require high levels of objectivity, precision, and generalizability of results. It is common in research that seeks to explain events through numerical data using structured instruments such as closed surveys, questionnaires, or standardized tests.

Qualitative approach: This approach is appropriate when the purpose is to explore and understand the meanings, perceptions, or experiences of participants within a specific context. Its central aim is to interpret social reality based on the voices and narratives of the subjects themselves. Consequently, it is frequently used in social, educational, or cultural studies employing techniques such as in-depth interviews, focus groups, and participant observation.

Mixed approach: The mixed approach is used when the goal is to integrate quantitative and qualitative perspectives to achieve a broader and deeper understanding of the analyzed phenomenon. This approach enables data triangulation and enriches findings by combining numerical measurement with the interpretation of meanings. It is especially useful in studies that require simultaneously quantifying a phenomenon and understanding the associated causes, meanings, or experiences, using instruments such as surveys and interviews.

4. Discussion

The comparative analysis of quantitative, qualitative, and mixed approaches highlights the epistemological diversity that characterizes contemporary scientific research. As stated by Hernández et al. [2], the research approach functions as a theoretical–methodological guide that directs decision-making throughout the entire investigative process, linking the formulation of the problem to the methods of data collection and analysis. In this sense, the quantitative approach, grounded in the positivist paradigm, focuses on the objective measurement of phenomena, the verification of hypotheses, and the identification of patterns through rigorous statistical analyses (Dzul, [6]; Hernández et al., [2]). Although this approach

offers precision, control, and the possibility of generalization, it may be limited in its ability to capture subjective or symbolic dimensions of social reality.

In contrast, the qualitative approach, rooted in the interpretive tradition, is oriented toward the deep understanding of meanings, experiences, and social processes as lived and expressed by individuals (Martínez, [5]; Hernández et al., [2]). Its inductive logic and methodological flexibility make it possible to grasp the complexity of phenomena and construct dense interpretations, even though it does not aim for statistical replicability. This approach is particularly relevant for educational, sociological, and cultural studies that prioritize the perspective of social actors.

The mixed approach emerges as an integrating alternative to the limitations of both approaches. As Martínez [5] and Hernández et al. [2] indicate, its strength lies in the coherent articulation of quantitative and qualitative strategies, allowing for data triangulation, enriched analysis, and the development of broader and deeper explanations. Likewise, authors such as Ayer [10], Bachelard [11], and Blanco [12] highlight that this approach is particularly effective for addressing complex phenomena that require both objective measurement and subjective interpretation.

Taken together, the three approaches represent complementary methodological pathways whose selection must align with the nature of the problem, epistemological coherence, and the objectives of the study. The researcher's ability to articulate these elements determines the quality and relevance of the knowledge produced.

5. Conclusions:

The study of the three research approaches leads to the conclusion that each offers a distinct and valuable perspective for understanding scientific and social phenomena. The quantitative approach, grounded in objectivity and rigorous measurement, is an essential tool for studies requiring the establishment of causal relationships, the evaluation of population trends, and the generation of generalizable results. Its contribution lies in its ability to provide solid, replicable empirical evidence supported by statistical techniques and strict methodological control.

The qualitative approach, in turn, provides a deep and contextualized understanding of human realities, highlighting subjective dimensions that cannot be captured through standardized instruments. Its emphasis on interpretation, methodological flexibility, and reflective fieldwork makes it fundamental for exploring cultural processes, meanings, narratives, and social practices in all their complexity. Although it does not seek to generalize results, it offers indispensable analytical richness for understanding phenomena that transcend quantification.

The mixed approach positions itself as a comprehensive alternative that overcomes the dichotomy between objectivity and subjectivity. By combining quantitative and qualitative strategies, it provides a broader understanding of phenomena, integrating general trends with in-depth interpretations of specific contexts. Its main contribution lies in data triangulation and the possibility of constructing multidimensional explanations that address complex research

questions. However, it requires strong methodological training and careful planning to ensure coherent integration of both approaches.

In summary, the choice of a research approach should not be based on personal preference, but on criteria of epistemological coherence, methodological relevance, and alignment with the problem and objectives of the study. A rigorous selection of the approach strengthens the validity of the research and contributes to the development of robust, relevant, and meaningful scientific knowledge.

References

- [1] Hernández, R., Fernández, C., & Baptista, P. (2007). *Fundamento de metodología de la investigación*. México.
- [2] Hernández, R., Fernández, C., & Baptista, P. (2018). *Fundamento de metodología de la investigación* (6ª ed.). México: McGraw Hill.
- [3] Martínez, H. E. (2025). Fundamentos filosóficos del conocimiento científico: gnoseología, epistemología, paradigmas y enfoques de investigación. En *Filosofía, essência e existência: questões fundamentais e reflexões filosóficas* (pp. 117–149). Atena Editora. <https://doi.org/10.22533/AT.ED.7501125240310>
- [4] Martínez Barrios, H. E., & Escobar Brochero, A. R. (2025). *Literature review in scientific research: Foundations, scope, and methodological guidelines for its preparation*. International Journal of Applied Mathematics, 38(10s), (pp 915 – 922). DOI: [10.12732/ijam.v38i10s.1005](https://doi.org/10.12732/ijam.v38i10s.1005)
- [5] Martínez, H. E. (2010). *El proceso de investigación científica en la universidad*. Valledupar: Fundación Élite.
- [6] Dzul, M. (2013). *Los enfoques de la investigación científica*. Recuperado de <https://www.uaeh.edu.mx>
- [7] Normas APA. (2022). *Enfoque cualitativo y cuantitativo*. Recuperado de <https://normasapa.net>
- [8] Pérez Serrano, G. (1994). *Investigación cualitativa: Retos e interrogantes. II Técnicas y análisis de datos* (Cap. I, Técnicas de investigación en educación social). Editorial Muralla.
- [9] Gómez, A. (2010). Paradigmas, enfoques y tipos de investigación. Recuperado de <https://issuu.com>
- [10] Martínez, H. E., Pumarejo, H. M., Montero, M. J., & Monter, E. (2024). State of the art design: Reflections, meaning, objective, structure and example. *Russian Law Journal*, 12(1). <https://doi.org/10.52783/rlj.v12i1.3931>
- [11] Ayer, A. J. (Ed.). (1965). *El positivismo lógico*. Fondo de Cultura Económica.
- [12] Bachelard, G. (1975). *Epistemología*. Anagrama.
- [13] Blanco, J. J. (1974). Sobre la disputa del positivismo en la sociología alemana. *Revista Española de la Opinión Pública*, (36), 105–121.