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BEYOND THE DICHOTOMY: AN INTEGRATED ANALYSIS OF QUALITATIVE, QUANTITATIVE, AND MIXED-METHOD APPROACHES IN EDUCATIONAL RESEARCH

PARA ALÉM DA DICOTOMIA: UMA ANÁLISE INTEGRADA DAS ABORDAGENS QUALITATIVA, QUANTITATIVA E MISTA NA PESQUISA EDUCACIONAL

MÁS ALLÁ DE LA DICOTOMÍA: UN ANÁLISIS INTEGRADO DE ENFOQUES CUALITATIVOS, CUANTITATIVOS Y MIXTOS EN LA INVESTIGACIÓN EDUCATIVA

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ABSTRACT

This article aims to analyze the fundamental characteristics of qualitative, quantitative, and mixed methods approaches in scientific research, discussing the reasons that contribute to the recurring conceptual confusion between these perspectives in academia. It is a bibliographic research, descriptive-analytical in nature and with a qualitative approach, examining reference works in the area of scientific methodology. The results show that the three approaches have distinct, yet articulable, epistemological foundations, purposes, and procedures, and that conceptual confusion often stems from a lack of clarity regarding the distinction between technical procedures and methodological approaches. The study proposes analytical frameworks that systematize these articulations, highlighting that methodological choice should be guided by the research objectives and the problem investigated. It concludes that an integrated understanding of these approaches strengthens scientific rigor and supports more coherent methodological choices in the training of researchers.

Keywords: Qualitative Research. Quantitative Research. Mixed Methods. Scientific Methodology. Researcher Training.

RESUMO

O presente artigo visa analisar as características fundamentais das abordagens qualitativa, quantitativa e mista na pesquisa científica, discutindo as razões que contribuem para a recorrente confusão conceitual entre essas perspectivas no meio acadêmico. Trata-se de uma pesquisa bibliográfica, de natureza descritivo-analítica e abordagem qualitativa, que examina produções de referência na área da metodologia científica. Os resultados

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evidenciam que as três abordagens possuem fundamentos epistemológicos, finalidades e procedimentos distintos, porém articuláveis, e que a confusão conceitual decorre frequentemente da falta de clareza sobre a distinção entre procedimentos técnicos e abordagens metodológicas. O estudo propõe quadros analíticos que sistematizam essas articulações, destacando que a escolha metodológica deve ser guiada pelos objetivos da pesquisa e pelo problema investigado. Conclui-se que a compreensão integrada dessas abordagens fortalece o rigor científico e subsidia escolhas metodológicas mais coerentes na formação de pesquisadores.

Palavras-chave: Pesquisa Qualitativa. Pesquisa Quantitativa. Métodos Mistos. Metodologia Científica. Formação de Pesquisadores.

RESUMEN

Este artículo busca analizar las características fundamentales de los enfoques cualitativos, cuantitativos y mixtos en la investigación científica, analizando las razones que contribuyen a la recurrente confusión conceptual entre estas perspectivas en el ámbito académico. Se trata de una investigación bibliográfica, de naturaleza descriptiva-analítica y con un enfoque cualitativo, que examina obras de referencia en el área de la metodología científica. Los resultados muestran que los tres enfoques tienen fundamentos, propósitos y procedimientos epistemológicos distintos, pero articulables, y que la confusión conceptual a menudo se deriva de la falta de claridad en la distinción entre procedimientos técnicos y enfoques metodológicos. El estudio propone marcos analíticos que sistematizan estas articulaciones, destacando que la elección metodológica debe guiarse por los objetivos de la investigación y el problema investigado. Se concluye que una comprensión integrada de estos enfoques fortalece el rigor científico y apoya elecciones metodológicas más coherentes en la formación de investigadores.

Palabras clave: Investigación Cualitativa. Investigación Cuantitativa. Métodos Mixtos. Metodología Científica. Formación de Investigadores.

1 INTRODUCTION

Scientific research plays a central role in the production of knowledge, constituting a fundamental instrument for understanding, explaining and transforming reality. According to Lakatos and Marconi (2017), research is a formal procedure, with a method of reflective thinking, which requires scientific treatment and is organized to know reality or discover partial truths. In this context, the qualitative, quantitative, and mixed approaches stand out as the most recurrent in scientific production, each with its own epistemological foundations, specific objectives, and different forms of data collection, analysis, and interpretation. However, despite being widely used, it is observed in academic practice that students and even researchers show difficulties in adequately distinguishing these approaches, which can compromise the methodological coherence of scientific works.

This conceptual difficulty often occurs due to the inappropriate use of terms, the fragility in methodological training, and the superficial understanding of the bases that support each type of research. Gil (2019) points out that the choice of methodological approach should be directly linked to the objectives of the study and the type of problem investigated. However, it is common to find projects that mix concepts in the wrong way or that define the approach only by the type of data collection instrument, disregarding its theoretical foundations. A recurring mistake, for example, is to classify as mixed research studies that only present numbers and words side by side, without the planned methodological integration required by this approach (Creswell; Clark Plan, 2007).

In this context, studies are needed to systematize and clarify the differences between qualitative, quantitative and mixed research, especially in the context of initial and continuing education of researchers. Deepening the discussion about the specificities of each method, highlighting its theoretical bases, purposes, potentialities and limitations is a starting point.

Qualitative research, according to Minayo (2009), is concerned with the universe of meanings, values, beliefs and attitudes, seeking to understand the phenomena from the perspective of the subjects. Quantitative research, according to Fonseca (2002), is characterized by the use of quantification, both in the collection and treatment of data, employing statistical techniques to ensure greater objectivity and generalization of the results. Mixed research, in turn, combines the two approaches, allowing the integration between numerical and interpretative data, as advocated by Creswell and Plano Clark (2007), but requires an intentional and articulated methodological design, going beyond the simple juxtaposition of techniques.

In this sense, this article aims to analyze the fundamental characteristics of qualitative, quantitative and mixed research, as well as to discuss the reasons that contribute to the recurrent conceptual confusion between these approaches in the academic environment. The choice of the theme is justified by its relevance for the initial and continuing education of researchers, including undergraduate and graduate students and authors of course completion papers, since methodological clarity is an essential condition for scientific rigor and for the quality of academic productions. Thus, an analysis is proposed that goes beyond the qualitative-quantitative dichotomy, highlighting the possible articulations and the criteria for reasoned methodological choices.

The article presents, initially, a theoretical foundation that separately addresses the three methodological approaches. Next, the methodology used is described, characterized as bibliographic research. Subsequently, a comparative analysis is carried out based on the authors consulted, synthesizing the differences, similarities and contexts of application of each approach. Finally, the final considerations are presented, highlighting the contribution of the study to the strengthening of methodological understanding in the field of scientific research, with emphasis on overcoming common misconceptions in investigative practice.

2 THEORETICAL FOUNDATION

This section presents the conceptual bases of qualitative, quantitative and mixed research, based on renowned authors of scientific methodology, aiming to understand its characteristics, applications and theoretical foundations.

2.1 QUALITATIVE RESEARCH

Qualitative research is characterized by the search for a deep understanding of social phenomena, considering the meanings, motivations, values, beliefs and relationships established by the subjects in their life contexts. According to Minayo (2009), the qualitative approach works with the universe of meanings, motives, aspirations, beliefs, values and attitudes, which cannot be reduced to the operationalization of quantitative variables.

Bogdan and Biklen (1994) highlight that qualitative research has the following main characteristics: the natural environment as a direct source of data; the descriptive character; the researcher as the main collection instrument; the concern with the process and not just with the result; and the appreciation of the meaning attributed by the participants to their

experiences. Thus, the focus is not on the quantification of the data, but on the interpretation of the reality investigated.

As for the procedures, the qualitative research uses instruments such as interviews, participant observation, focus groups, documentary analysis and narratives, which enable an in-depth understanding of social phenomena. Gil (2019) emphasizes that this type of approach is particularly indicated when it is intended to investigate complex, subjective phenomena related to human interactions.

As examples of the application of qualitative research, studies in the area of education can be cited, such as investigations on pedagogical practices, teacher-student relationships, learning processes, school inclusion, among others. It is also widely used in the social sciences, psychology, social work, and health, especially in research that requires understanding the subjective dimension of the subjects.

Among the main authors of the qualitative approach, Minayo (2009), Bogdan and Biklen (1994), Chizzotti (2010), Lüdke and André (2013) and Gil (2019) stand out, whose contributions strengthen the theoretical-methodological bases of this research modality.

2.2 QUANTITATIVE RESEARCH

Quantitative research is characterized by the use of quantification both in data collection and analysis, seeking objectivity, measurement and generalization of results. According to Fonseca (2002), this type of research uses mathematical language to describe the causes of a phenomenon, the relationships between variables and the distribution of the population studied.

For Lakatos and Marconi (2017), the main purpose of quantitative research is to prove hypotheses, test theories and identify cause and effect relationships between variables, through the application of structured instruments and statistical analysis. The data is collected in a standardized way, allowing greater control and accuracy of the results.

Among the main characteristics of quantitative research are: objectivity, the neutrality of the researcher, the use of structured instruments (such as closed questionnaires, scales and tests), the possibility of generalizing the results and the use of statistical techniques for data analysis. Gil (2019) states that this approach is especially suitable when seeking to measure phenomena, identify patterns, and make inferences about large populations.

The stages of quantitative research usually involve: definition of the problem and hypotheses, literature review, definition of variables, choice of collection instruments,

application of instruments, tabulation of data, statistical analysis and interpretation of results. These steps ensure greater methodological rigor to the study.

Quantitative research is widely used in areas such as administration, economics, health, education, engineering, and exact sciences, and is appropriate for survey studies, experimental research, and correlational research.

2.3 MIXED METHODS

Mixed Methods Research, also known as Mixed Methods Research, is characterized by the integration of qualitative and quantitative approaches in the same study, enabling a broader and deeper understanding of the phenomenon investigated. According to Creswell and Plano Clark (2007), this type of research allows the combination of numerical and narrative data, favoring the triangulation of results and increasing the reliability of the analyses.

In the debate presented by Minayo and Sanches (1993), the complementarity between quantitative and qualitative methods is defended as essential for a more complete investigation in public health. While the quantitative approach operates at observable and measurable levels, such as epidemiological data and health indicators, the qualitative approach delves into the meanings, intentions, and subjective contexts of social actors. This distinction implies the possibility of methodological integration, in which each approach contributes with its specificities to the understanding of social reality.

Thus, mixed research emerges as a methodological strategy that overcomes the false dichotomy between methods, articulating statistical generalization with interpretative depth. As suggested in the article, the quantitative study can generate questions for qualitative investigation, and vice versa, promoting a more dialectical and multidimensional analysis. This integration enriches the investigation and reflects a more realistic and comprehensive view of health phenomena, aligning with the principle that both approaches are necessary (Minayo & Sanches, 1993).

For these authors, the main advantage of mixed research is the possibility of compensating for the limitations of one approach with the potential of the other. While quantitative research offers generalization and statistical precision, qualitative research provides interpretive depth and contextual understanding.

There are different mixed survey models. Among the main ones, the following stand out:

a) Convergent model, in which qualitative and quantitative data are collected simultaneously and analyzed in an integrated manner;
b) Explanatory sequential model, in which the quantitative stage occurs first, followed by the qualitative one to deepen the results;
c) Exploratory sequential model, in which qualitative research precedes quantitative research, helping in the construction of instruments and hypotheses.

According to Sampieri, Collado and Lucio (2013), mixed research requires greater methodological mastery from the researcher, as it implies planning, executing and integrating two distinct approaches in a single research design. This modality has been widely used in educational, social, health and public policy evaluations.

Therefore, mixed research is configured as a robust and flexible approach, capable of expanding the possibilities of interpretation and strengthening the results of scientific investigation.

2.4 TYPES OF RESEARCH AND THEIR RELATIONSHIP WITH METHODOLOGICAL APPROACHES

In scientific methodology, it is essential to distinguish between the nature of the research (whether it is basic or applied), the technical procedures (how data is collected and analyzed) and the methodological approach (qualitative, quantitative or mixed). These dimensions are not mutually exclusive, but complementary, and can be combined in different ways according to the research problem and the objectives of the study (Lakatos; Marconi, 2017). This section explores these articulations, showing how the same type of research can be conducted under different approaches.

2.4.1 Basic and applied research: Articulations with the approaches

Basic research aims to generate new knowledge, without immediate concern for practical application, aiming at theoretical advancement and understanding of phenomena (Gil, 2019). Applied research, on the other hand, seeks to solve concrete problems, producing knowledge that can be used in specific contexts. Both can adopt any of the three methodological approaches.

Table 1

Examples of types of research according to purpose and methodological approach.

Purpose of the Research	Methodological Approach	Example
Basic Research	Qualitative	This study investigates, through interviews and discourse analysis, how the professional identities of teachers in initial training are constructed, focusing on the understanding of subjective and symbolic processes, with no intention of immediate intervention.
Basic Research	Quantitative	This study measures the correlation between hours of study and performance in standardized tests of high school students through questionnaires and statistical analysis, seeking to generalize patterns.
Basic Research	Mixed	Study that combines a (quantitative) survey to map student engagement profiles with focus groups (qualitative) to understand the motivations behind the different profiles, integrating the data to build a more robust theoretical typology.
Applied Research	Qualitative	Action research in a school to understand the local causes of school dropout, using participant observation and interviews with the community, aiming to propose a specific action plan.
Applied Research	Quantitative	Experimental study to test the effectiveness of a new educational software, comparing grades and retention rates between control and experimental groups.
Applied Research	Mixed	Evaluation of a government digital inclusion program that uses questionnaires to measure reach and satisfaction and qualitative case studies to understand impacts on the routine of families, integrating the results to recommend adjustments in the policy.

Source: Prepared from Gil (2019) with support from ChatGPT Business (2025).

2.4.2 Bibliographic and documentary research in the different approaches

Both bibliographic research (analysis of already published material) and documentary research (analysis of unpublished primary sources) are technical procedures that adapt to different approaches, depending on how the data are treated.

Qualitative bibliographic research: involves the interpretative and critical review of the literature, as a theoretical analysis of the concept of "curricular justice" in scientific articles, identifying nuances and constructing arguments (Gil, 2019).

Quantitative literature search: it is characterized by a systematic review with meta-analysis, where data from multiple primary studies are collected, coded, and submitted to statistical analysis to synthesize results and calculate effect sizes.

Mixed bibliographic research: it can integrate, for example, a meta-analysis (quantitative) with a thematic analysis of the discussions and limitations pointed out in the reviewed articles (qualitative), offering both a numerical and interpretative synthesis of the field.

Qualitative documentary research: hermeneutic analysis of teachers' class diaries or minutes of school councils, seeking to understand decision-making processes and organizational culture (Lakatos; Marconi, 2017).

Quantitative desk research: Coding and statistical analysis of data contained in medical records (e.g., frequency of diagnosis, length of hospital stay) or in educational administrative databases (e.g., pass rates by grade).

Mixed documentary research: a study that quantitatively analyzes the frequency of certain terms in a corpus of educational laws and, qualitatively, the context and argumentation in which these terms appear, to understand the evolution of political discourse.

2.4.3 Case study, survey and experimental research: Possible articulations

The most common technical procedures can also be planned under different methodological logics.

Qualitative case study: in-depth ethnographic investigation of a single school, using observation and interviews to understand its internal culture (Yin, 2015).

Quantitative case study: intensive statistical analysis of data from a single municipality (a "case") to model economic and educational factors, using regressions and other tests.

Mixed case study: research on an inclusion policy in a university that combines institutional data analysis (quantitative) with interviews with managers and students (qualitative), integrating the perspectives for a comprehensive evaluation.

Quantitative survey: the most traditional form, with closed questionnaires applied to a representative sample to generalize results (Fonseca, 2002).

Qualitative survey: less common, but possible, such as the application of questionnaires with extended open questions to a large group, whose answers are analyzed by content.

Mixed Survey: convergent model where the same group answers a questionnaire with scales (quantitative) and a set of open questions (qualitative), and the results are integrated for analysis.

Quantitative experimental research: the gold standard in the natural and health sciences, with control and experimental groups, randomization, and statistical analysis of results.

Qualitative experimental research: less common but possible design in social sciences, such as narrative or observational experiments where the focus is on understanding the processes and meanings attributed by participants to the experience.

Mixed experimental research: An experiment that measures objective outcomes (e.g., grades) and then conducts interviews with participants to understand their perceptions and experiences during the experiment (explanatory sequential model).

To illustrate how the same research theme can be conducted from different methodological perspectives, Chart 2 presents a concrete example related to the implementation of active methodologies in higher education, detailing how the formulation of the problem, the objectives, the procedures and the analysis vary according to the approach adopted.

Table 2

Implementation of active methodologies in higher education

Aspect	Qualitative Research	Quantitative Research	Mixed Research
Example title	"Teachers' perceptions about the challenges in the implementation of active methodologies in undergraduate courses"	"Impact of active methodologies on academic performance: an experimental study with university students"	"Implementation of active methodologies in higher education: a mixed analysis of perceptions and results"
General objective	Understand the experiences, challenges and meanings attributed by teachers to the adoption of active methodologies.	To measure the effect of the use of active methodologies on the final grades of university students.	Integrate quantitative data on academic performance with qualitative perceptions of professors and students about the implementation process.
Technical procedure	Field research with participant observation and semi-structured interviews.	Experimental research with control and experimental groups, application of pre and post-tests.	Field research (qualitative) + survey (quantitative) in a convergent model.
Instruments	Interview script, field diary, recordings.	Standardized questionnaires,	Mixed questionnaire (scales + open

Aspect	Qualitative Research	Quantitative Research	Mixed Research
		performance tests, Likert scales.	questions), interviews, document analysis.
Sample	15 professors from one institution (intentional sample).	200 students, randomized into two groups.	150 students (survey) + 10 teachers (interviews).
Data analysis	Thematic content analysis (Bardin).	Inferential statistics (t-test, ANOVA).	Descriptive statistical analysis + qualitative thematic analysis, with integration into the discussion.
Result example	Emerging categories: "institutional resistance", "inadequate training", "satisfaction with interaction".	Significant difference ($p < 0.05$) in the scores of the experimental group.	Triangulation: high student satisfaction (87%) related to the pedagogical flexibility perceived in the interviews.

Source: Prepared by the authors based on the theoretical references discussed.

The framework shows how the implementation of active methodologies in higher education can be approached from different methodological perspectives, each with specific objectives, procedures and forms of analysis. While the qualitative approach prioritizes the understanding of the experiences and meanings attributed by the actors involved, the quantitative approach focuses on measuring effects and testing causal relationships. The mixed approach, in turn, integrates these two dimensions, allowing not only to quantify results, but also to contextualize them based on the narratives and perceptions of the participants. This exemplification reinforces that the choice of approach should not be guided by the theme itself, but by the research questions and the types of understanding that are

intended to be achieved, as defended by Gil (2019) and Creswell and Plano Clark (2007). Thus, methodological clarity becomes fundamental for the coherence of the project and for the robustness of the results obtained.

2.4.4 Articulated synthesis: Differentiating technical procedures and methodological approaches

As demonstrated, the technical procedure defines the "how" the data is obtained, while the methodological approach defines the "how" it is treated and interprets these data. A case study is not inherently qualitative; A survey is not necessarily just quantitative. Chart 3 summarizes these possible articulations, with examples that illustrate the flexibility of research designs, showing that the same procedure can be conducted under different analytical logics, depending on the objectives and the treatment given to the data.

Table 3

Articulation between technical procedures and methodological approaches

Technical Procedure	Qualitative Approach (Example)	Quantitative Approach (Example)	Mixed Approach (Example)
Case Study	Ethnography of a school community.	Statistical analysis of municipal data (the municipality as a case).	Case of a policy: institutional data (QUANT) + interviews with beneficiaries (QUAL).
Survey	Questionnaire with open questions analyzed by content.	Questionnaire with Likert scales and statistical analysis.	Questionnaire with closed (QUANT) and open (QUAL) parts, integrated into the analysis.

Technical Procedure	Qualitative Approach (Example)	Quantitative Approach (Example)	Mixed Approach (Example)
Experimental Research	Observational experiment focused on interaction and perception.	Randomized controlled trials with outcome analysis.	Experiment with objective measures (QUANT) and post-test focus groups (QUAL).
Bibliographic Research	Theoretical-conceptual analysis of the literature.	Systematic review with meta-analysis.	Meta-analysis (QUANT) + critical analysis of the discussions in the articles (QUAL).
Desk Research	Discourse analysis of minutes or diaries.	Statistical analysis of historical series in archives.	Frequency analysis of terms (QUANT) and contextual analysis of their use (QUAL) in documents.

Source: Prepared by the authors, based on the authors cited. Note: The examples illustrate possibilities of articulation; The final definition depends on the objectives, treatment and integration of the data.

In addition to the relationship between procedures and approaches, it is also important to consider the nature of the research (basic or applied). Chart 4 integrates these three dimensions: approach, nature, and procedures.

Table 4

Relationship between research approach, nature and procedures

Approach	Nature of the Research	Possible Technical Procedures	Key features
Qualitative	Basic	Bibliographic research; documentary research; case study; ethnographic research; Field research	Emphasis on meanings, subjectivities, social contexts and interpretation of phenomena.
Qualitative	Applied	Case study; action research; participant research; Field research	Resolution of social, educational and institutional problems through an in-depth understanding of reality.
Quantitative	Basic	Bibliographic research; survey; experimental research; Correlational research	Use of numerical data, measurement of variables, statistical tests and generalization of results.
Quantitative	Applied	Survey; experimental research; Evaluative research	Focus on decision-making, evaluation of results, diagnosis and objective interventions.
Mixed	Basic	Combined literature search; case study with statistical data; Exploratory and descriptive research	Integration of qualitative and quantitative data to broaden the understanding of phenomena.

Approach	Nature of the Research	Possible Technical Procedures	Key features
Mixed	Applied	Case study with survey; evaluative research; educational research; Health Research	Complementarity between numbers and interpretations, strengthening analysis and decision-making.

Source: Prepared by the authors, based on Gil (2019), Lakatos and Marconi (2017), Creswell and Plano Clark (2007), Sampieri, Collado and Lucio (2013).

The qualitative, quantitative and mixed approaches are not to be confused with the nature or procedures of research, but are articulated in a complementary way, enabling different methodological combinations according to the objectives and the problem investigated. Thus, the same research can be, for example, basic or applied, bibliographic, documentary or case study, and also assume a qualitative, quantitative or mixed approach.

The methodological choice must be made in layers: first, the problem is defined and whether the nature is basic or applied; then, the most appropriate technical procedure to access the data is selected; and, finally, the approach (qualitative, quantitative or mixed) that will guide the analysis and interpretation is determined, ensuring internal coherence and scientific rigor to the research project.

2.5 COMPARATIVE ILLUSTRATIVE STUDY OF METHODOLOGICAL APPROACHES

To elucidate the epistemological and procedural distinctions between the qualitative, quantitative, and mixed approaches, this section presents an example applied to the same relevant educational problem: the factors that influence the permanence and learning of students in high school, with a focus on specific populations such as quilombola students. The comparative analysis demonstrates how the formulation of the problem, the objectives, the collection and the analysis of data are reconfigured according to the logic of each approach, as discussed by Creswell and Plano Clark (2013) and Sampieri, Collado and Lucio (2013).

All research must indisputably have a central research problem; We exemplify this one, to better clarify the reader: what are the factors that influence the permanence and

learning of students in the 1st grade of IFTO High School, with emphasis on populations in situations of social vulnerability, such as quilombola students? The choice of this theme is justified by its social and educational relevance, allowing us to illustrate how different approaches can shed light on different dimensions of the same complex phenomenon.

2.5.1 Quantitative Approach Research

Continuing, we have an example focusing on statistical associations, as it is a quantitative research. A good title option would be: factors associated with dropout and failure of students in the 1st grade of IFTO High School: a quantitative study. Thus, the general objective can be: to analyze, through quantitative data, the factors statistically associated with student dropout and failure.

The specific research problem would be: which socioeconomic, pedagogical and infrastructure variables (income, transportation, attendance, performance) present a significant correlation with dropout and failure rates? For data collection in a quantitative research, it is feasible to apply a structured questionnaire, with closed questions and scales (e.g., Likert), to a representative sample of approximately 200 students. Variables would include family income, commuting time, attendance, grades, internet access, and motivation.

For data analysis, the use of descriptive statistics (frequencies, means, standard deviations) and inferential statistics (correlations, chi-square, logistic regression) is recommended. The results are presented in tables and graphs, seeking to identify measurable patterns and relationships (Fonseca, 2002). Regarding the epistemological characterization, this approach, of a positivist nature, seeks objectivity, the generalization of the results to the population and the testing of predetermined hypotheses. Its strength lies in numerical precision and the identification of broad trends; their limitation, in the inability to grasp the meanings and contexts behind the numbers (Gil, 2019).

For a second example, focusing on a specific population, we would have the title: Factors associated with the permanence and learning of quilombola students in IFTO High School: a quantitative study, with the general objective of quantifying the relationship between living conditions, perception of discrimination and academic performance among quilombola students. The specific research problem would be: Is there a statistical association between the perception of racial discrimination (measured by scale), the conditions of transportation/income and the school performance of these students? The collection and analysis would be similar to the previous example, but with instruments adapted to capture

specific variables, such as perception of discrimination and access to retention policies, and the analysis would compare performance averages between groups (e.g., high vs. low index of perceived discrimination).

2.5.2 Qualitative Approach Research

On the other hand, the qualitative approach would focus on the perceptions and meanings attributed by the actors involved. An example would be entitled: perceptions of students and teachers about the factors that influence dropout and failure in the 1st grade of IFTO High School, with the general objective of understanding, from the perspectives of the actors involved, the meanings, challenges and dynamics that influence school (dis)continuity.

The specific research problem would be: how do students, teachers and managers interpret and experience the processes that lead to dropout and failure in the specific context of IFTO? Data collection would take place through semi-structured interviews, focus groups and participant observation with an intentional sample of 15 to 25 participants, where the focus is on depth, not on numerical representativeness.

Data analysis would be carried out through thematic content analysis (Bardin, 2016) or discourse analysis, involving transcription, coding, emergent categorization (e.g., "hostile school climate", "identity conflict", "lack of pedagogical support") and hermeneutic interpretation of the data (Minayo, 2009). The epistemological characterization here is interpretative or phenomenological based, prioritizing depth, contextualization, and understanding of social processes, without seeking statistical generalizations, but offering a dense and analytical description of the phenomenon in its natural context (Bogdan; Biklen, 1994).

Another example, focusing on the quilombola experience, could be entitled: Here inside and outside: narratives of quilombola students about the challenges of permanence and learning in IFTO High School, with the general objective of analyzing the identity narratives and social experiences of quilombola students in the institutional school environment. The specific research problem would be: how do identity trajectories, cultural encounters and disagreements, and experiences of (in)visibility impact the process of permanence and learning? The collection and analysis would use narrative interviews, oral history or discussion groups, with the analysis focused on the construction of meanings about race, belonging and education, going beyond material factors.

2.5.3 Mixed Approach Research (Qualitative + Quantitative)

Mixed research, on the other hand, is characterized by the planned and interpretative integration of qualitative and quantitative approaches in a single study, aiming at a more comprehensive understanding of what would be possible with a single approach (Creswell; Clark Plan, 2007). According to Sampieri, Collado and Lucio (2013), its main advantage is the methodological triangulation, which compensates for the limitations of one approach with the strengths of the other.

Among the main models, the explanatory sequential (QUANT → QUAL) stand out, where the quantitative phase identifies patterns and relationships and the qualitative phase deepens and explains these results; the exploratory sequential phase (QUAL → QUANT), in which the qualitative phase explores a little-known phenomenon and substantiates instruments or hypotheses for the subsequent quantitative phase; and the convergent (parallel), where the two phases are conducted simultaneously and the results are integrated into the final interpretation.

An applied example of the explanatory sequential model would be entitled: Factors that influence the dropout of students from the 1st grade of IFTO High School: a mixed-methods study, with the integrative research problem: How do the factors quantitatively most associated with the intention to drop out manifest themselves and are experienced in the daily lives of students? In the quantitative phase, a survey is applied with 200 students, whose statistical analysis reveals that 42% of students point to "problems with transport" as the main barrier to permanence, this being the most frequent variable.

In the qualitative phase, semi-structured interviews are conducted with 15 students who indicated transportation as a critical problem, and the narratives reveal that the obstacle goes beyond the distance metric, involving insecurity on the way, constant vehicle delays, overcrowding, and the resulting physical and mental fatigue.

Integration and triangulation, the central stage of the mixed research, qualifies and contextualizes the quantitative data: the number "42%" answers "what" and "how much", while the interviews answer "how" and "why" this fact is decisive. The integrated interpretation concludes that transportation-related evasion is not a mere logistical problem, but a psychosocial phenomenon that undermines motivation, increases absenteeism, and generates a feeling of helplessness. This dialogical articulation between the numerical and the narrative is what effectively characterizes the research as mixed.

It is a common mistake, even in academic papers, to consider a survey as mixed due to the simple joint presence of numbers and words. Mixed research requires: intentional planning of the two components in the research design; specific and rigorous data collection for each approach; own analysis for each data set; and explicit stage of integration in interpretation, where one piece of data illuminates, complements, expands or questions the other.

A qualitative survey that only enumerates frequencies in its categories (e.g., "80% of respondents mentioned lack of faculty support") is making use of an internal descriptive quantification, but is not conducting a mixed survey. The absence of an integrated design, valid quantitative instruments and statistical analysis prevents this classification. The example above of transportation illustrates precisely the difference between measuring a prevalence (42%) and integrating this measure with contextual meanings to generate a more robust conclusion.

Another example, following the sequential exploratory model with a quilombola focus, could be entitled: Factors of permanence and learning of quilombola students of IFTO: an exploratory mixed-methods study, with the general objective of developing and validating a quantitative instrument based on a preliminary qualitative understanding of the dimensions relevant to quilombola permanence.

The specific research problem would be: which constructs and dimensions, qualitatively identified as central to quilombola students, can be measured and validated on an expanded scale? The design would first involve a qualitative phase with interviews and focus groups to explore the theme, identifying categories such as "institutional discrimination", "identity strengthening" and "community support"; then, a development phase to build a questionnaire with scales based on these categories; and, finally, a quantitative phase with the application of the questionnaire to a larger sample to validate the constructs and test their relationships.

The presentation of these examples makes it clear that mixed research is not the simple juxtaposition of numbers and words. As Creswell and Plano Clark (2007) state, it requires an intentional integrated design, with clear phases and a final interpretation that dialogues with both types of data. It is a common mistake, as pointed out in the literature, to classify as mixed a qualitative research that only mentions descriptive frequencies (e.g., "10 of the 15 interviewees reported...").

Table 5 summarizes the key differences between the approaches in the context of the problem presented

Table 5

Comparison of Approaches in the Study of School Permanence

Aspect	Quantitative Approach	Qualitative Approach	Mixed Approach
Central Question	"What?" and "How much?" (Prevalence, association)	"How?" and "Why?" (Meaning, process)	Combines "What/How much?" with "How/Why?"
Epistemological Logic	Positivist, objectivist	Interpretive, constructivist	Pragmatic, integrative
Typical Design	Survey, experimental	Case study, ethnography	Sequential (explanatory/exploratory), Convergent
Main Result	Generalization, hypothesis testing	Contextual understanding, grounded theory	Extended explanation, triangulation
Example in IFTO	Correlation between income and dropout	Meaning of dropout for the student	Explain how low income leads to dropout

Source: Prepared by the authors based on the theoretical frameworks discussed (Gil, 2019; Lakatos & Marconi, 2017).

Therefore, the choice between these approaches should be guided not by fads, but by a rigorous reflection on which set of questions and which type of understanding best meets the objectives of the research, thus ensuring the methodological rigor essential to quality scientific production, especially in complex areas such as Education.

Table 6

Classification of the types of research according to the nature, objectives and technical procedures

As to Nature	Regarding the Objectives	Regarding Technical Procedures
Basic Research	Exploratory	Case Study
(Generates knowledge)	Descriptive	Participant Research
	Explanatory	Ex-Post-Facto Research
Applied Research		Desk Research
(Generates products/processes)		Bibliographic Research
		Experimental Research
		Operations Research

Source: Prepared by the authors based on the theoretical frameworks discussed (Gil, 2019; Lakatos & Marconi, 2017).

This table systematizes how these categories are articulated and highlights the flexibility and complementarity of the research designs, reinforcing that the methodological choice must be coherent with the problem and the objectives of the investigation.

3 METHODOLOGY

The present study is characterized as a bibliographic research, with a qualitative approach and a descriptive-analytical nature, whose objective is to understand, discuss and systematize the different methodological approaches of scientific research, qualitative, quantitative and mixed, based on the analysis of consolidated academic productions in the area.

Bibliographic research was adopted because it enables the survey, reading, analysis and interpretation of already published works, such as books, scientific articles, theses and dissertations, allowing the researcher to come into direct contact with the knowledge produced on a given topic, as highlighted by Gil (2019) and Lakatos and Marconi (2017). This type of research is especially suitable when seeking to understand concepts, theoretical foundations, methodological classifications, and different epistemological perspectives.

The qualitative approach was chosen due to the interpretative character of the study, since the focus of the investigation is not on the measurement of numerical data, but on the understanding of the meanings, conceptions, characteristics and purposes attributed to the research approaches by the different authors analyzed. In this sense, the analysis favors the critical interpretation of the texts, conceptual categories and theoretical arguments, according to the assumptions of qualitative research defended by Minayo (2009).

As for the descriptive-analytical nature, the study seeks, initially, to describe the main characteristics of the qualitative, quantitative and mixed approaches, and, later, to analyze them in a comparative way, evidencing their differences, approximations, limits and potentialities. The analytical dimension allows the concepts to be presented, as well as to interpret them in the light of the specialized literature and reviewed empirical studies.

The selection of bibliographic material was based on criteria of thematic relevance, scientific rigor and recurrence of citation in the area of research methodology, prioritizing classic and contemporary authors widely used in the academic environment, such as Gil (2019), Minayo (2009), Creswell and Plano Clark (2007), Gatti (2012) and Sampieri, Collado and Lucio (2013). In addition, scientific articles published in indexed journals, especially in the areas of education, social sciences, and health, which explicitly presented the use of qualitative, quantitative, or mixed approaches were included.

The searches were carried out in academic databases and institutional repositories, such as SciELO, Google Scholar and repositories of public universities, using descriptors such as: research methodology, qualitative research, quantitative research, mixed research and mixed methods. After the initial survey, the titles, abstracts and, later, the full texts were read, selecting only the studies that presented direct adherence to the objectives of this research.

The data analysis was developed through interpretative and comparative reading of the selected works, seeking to identify how each author conceives the research approaches, which theoretical foundations are mobilized, which methodological procedures are valued and how these approaches are applied in empirical studies. Then, the main elements were organized into analytical categories, such as: research objectives, type of data, collection instruments, forms of analysis and purposes of the study.

In addition, the empirical studies analyzed were classified according to the approach adopted (qualitative, quantitative or mixed), allowing the construction of a comparative

synthesis table, which systematizes the main methodological elements observed in each type of research.

4 DATA ANALYSIS AND DISCUSSION

The discussion of the data obtained from the selection and examination of scientific articles that used the qualitative, quantitative and mixed approaches is presented. The analysis was conducted in an interpretative and comparative way, in the light of the theoretical references presented in the Theoretical Foundation, seeking to identify how these approaches have been effectively applied in scientific production and how their main methodological characteristics are confirmed in practice.

4.1 ANALYSIS OF STUDIES WITH A QUALITATIVE APPROACH

The studies analyzed, based on the qualitative approach, have as a central characteristic the search for an in-depth understanding of the phenomena in their natural contexts, considering the meanings, perceptions, social relations and processes experienced by the subjects. According to Minayo (2014), qualitative research works with the universe of senses, values, beliefs and attitudes, aspects that cannot be reduced to numerical data. This definition is confirmed in the studies examined, which prioritize the interpretation of social reality based on human experiences.

In the work 'The methodological construction of research in education', Gatti (2010) highlights that qualitative research plays a central role in educational investigations, especially because it allows the understanding of pedagogical practices, institutional relations and subjectivities involved in the educational process. For the author, unlike positivist approaches, qualitative research recognizes the complexity of the educational field and values the interaction between researcher and research subjects, an aspect also evidenced in the studies analyzed.

Similarly, Lüdke and André (2013) highlight that qualitative research in education values the natural environment as a direct source of data and the interaction between researcher and participants, fundamental aspects for understanding educational processes in their complexity.

Another recurrent element in qualitative studies is the use of flexible data collection instruments, such as semi-structured interviews, participant observation, document analysis, and focus groups. According to Bogdan and Biklen (1994), these instruments allow the

researcher to capture reality in a more sensitive and contextualized way, since the natural environment is the main source of data. In the studies examined, this centrality of the context and the valorization of the detailed description of the investigated phenomena are clearly perceived.

In the article published in the journal Ciência & Saúde Coletiva, Nagai and Queiroz (2011) use the qualitative approach to understand phenomena related to the insertion of complementary and alternative medicine in the basic network of health services. The study shows that this methodology is not restricted to the educational field, but is also widely used in the health sciences and social sciences. Through the analysis of the participants' narratives, the authors were able to apprehend social, subjective and institutional dimensions of the investigated phenomenon, aspects that would hardly be captured through exclusively quantitative methods.

When comparing the conceptions of Minayo (2014), Gatti (2010) and Bogdan and Biklen (1994), a theoretical convergence is observed regarding the understanding of qualitative research as an interpretative process, in which the researcher actively acts in the construction of knowledge. All authors argue that this type of research does not seek statistical generalizations, but rather a deep understanding of the phenomena in their complexity, which is confirmed in the studies analyzed.

In general, the analysis of the works shows that qualitative research is especially indicated when the objective of the study is to understand social, educational, cultural or institutional processes in depth. As Gil (2019) points out, this approach is appropriate when one wants to explore little-known realities, investigate perceptions, behaviors, and interactions, or understand meanings attributed by the subjects. Thus, the studies analyzed confirm, in practice, the theoretical foundations discussed in the grounds of this article.

4.2 ANALYSIS OF STUDIES WITH A QUANTITATIVE APPROACH

Studies classified as quantitative are generally characterized by the predominant use of structured data collection instruments, such as closed questionnaires, scales, standardized tests, and objective forms, as well as by the application of statistical procedures for analyzing the results. This approach focuses mainly on the measurement of variables, the identification of patterns, trends, and relationships between phenomena, in addition to the possibility of generalizing the results to larger populations, as highlighted by Gil (2019) and Lakatos and Marconi (2017).

In the studies analyzed with this approach, it is observed that the research objectives were directly related to the quantification of behaviors, opinions, levels of satisfaction, academic or organizational performance. This type of design confirms the conception presented by Fonseca (2002), when he states that quantitative research is based on objectivity, on the standardization of instruments and on the search for measurable and replicable results.

Another recurrent aspect in quantitative studies is the clear definition of the sample and the variables investigated, as well as the control, albeit partial, of external influences. The data, after being collected, are organized in spreadsheets, tables and graphs, and are submitted to descriptive and, in some cases, inferential statistical analyses, such as correlation, regression and significance tests. This procedural rigor reinforces the idea that quantitative research seeks to minimize the subjectivity of the researcher in the analysis of the results.

The methodological literature, such as that presented by Sampieri, Collado and Lucio (2013), highlights that quantitative research is especially appropriate when the researcher wants to test hypotheses, verify relationships between variables or evaluate the impact of certain interventions. The studies analyzed confirm this theoretical orientation, as they present formal structures for data collection, analysis and interpretation, aligned with previously defined statistical models.

However, it is also observed that, although quantitative research offers numerical precision and the possibility of generalization, it has limitations in terms of a deep understanding of the meanings, motivations and subjective experiences of the participants. This limitation is widely discussed by Gil (2019), when he states that the objectivity of numbers is not always sufficient to explain the complexity of social and educational phenomena.

In general, the quantitative studies analyzed confirm that this approach is indicated when it comes to measurement, control of variables, objectivity, and the possibility of comparison between groups. The results reinforce the theoretical foundations of this approach presented in the Theoretical Foundation, evidencing its relevance for investigations that demand statistical precision, but also pointing out the need for articulation with other approaches when the objective of the research requires greater interpretative depth.

4.3 ANALYSIS OF MIXED APPROACH STUDIES

The studies classified as belonging to the mixed approach show the systematic integration between quantitative and qualitative data, both in the collection process and in the analysis and interpretation of the results. Contrary to what is often assumed in the academic environment, mixed research is not characterized only by the simultaneous presence of numbers and speeches, but by the methodological articulation planned between the two approaches, as highlighted by Creswell and Plano Clark (2007).

The literature points out that mixed methods can take on different designs, among which the sequential models (explanatory and exploratory) and the convergent model stand out. In the explanatory sequential model, for example, first the quantitative collection and analysis takes place and, later, the qualitative stage is used to deepen or explain the numerical results. In the convergent model, the two approaches are applied simultaneously, and the results are integrated in the interpretative phase.

In the studies analyzed, it is observed that those that are really configured as mixed studies present, in an explicit way, the planning of the two approaches, the clear definition of the steps, the justification for the use of methodological integration and the explanation of how the data were articulated in the final analysis. This rigor confirms the conception of Sampieri, Collado and Lucio (2013), according to which mixed research requires greater methodological mastery, precisely because it operates in two distinct epistemological fields.

However, it was also found that there is significant conceptual confusion regarding the definition of mixed research. Many studies use the term "mixed" only because they present some numerical data together with descriptive information, without there being, in fact, structured methodological integration. This practice reinforces the misconception pointed out in the literature that not all research that uses quantitative and qualitative data can be automatically classified as mixed.

According to Creswell and Plano Clark (2007), for a study to be effectively considered mixed, it must comply, at least: (a) the collection of quantitative and qualitative data; (b) the analysis of both types of data; (c) the explicit integration between these data at some point in the research; and (d) the theoretical and methodological justification for the adoption of this approach. The absence of any of these stages compromises the characterization of the research as mixed.

Thus, the analysis of the studies shows that the mixed approach, when correctly applied, significantly expands the explanatory potential of the research, by allowing the

combination of the objectivity of the numerical data with the interpretative depth of the qualitative analyses. On the other hand, it also reveals that the lack of conceptual clarity and methodological rigor is still one of the main challenges for the proper use of mixed methods in the scientific field.

4.4 COMPARATIVE SYNTHESIS OF APPROACHES IN THE ANALYZED STUDIES

The analysis of the studies shows that the qualitative, quantitative and mixed approaches have distinct but complementary applicabilities. While qualitative studies prioritize the understanding of the meanings, perceptions, and experiences of subjects in their social contexts, quantitative studies focus on the objective measurement of variables and the possibility of generalizing the results. Mixed studies, on the other hand, articulate these two dimensions, expanding the interpretative and explanatory possibilities of the phenomena investigated.

It is observed, therefore, that the studies analyzed confirm, in practice, the theoretical bases discussed throughout this article. It is evident that the choice of the methodological approach should not occur arbitrarily, but in line with the objectives of the research, the problem investigated and the type of data necessary for the analysis, as defended by Gil (2019), Minayo (2014) and Creswell and Plano Clark (2007). Thus, each method responds to different investigative demands.

This synthesis reinforces the importance of the researcher mastering the conceptual, epistemological and operational differences between the approaches, avoiding methodological mistakes and ensuring greater scientific rigor to academic productions. Clarity in the choice of method contributes directly to the internal coherence of the scientific work and to the validity of the results obtained.

The analysis of the literature reveals that the qualitative, quantitative and mixed approaches have different purposes, although they can be used in a complementary way. Qualitative research stands out for its ability to understand complex, subjective and contextualized phenomena, prioritizing the interpretation of meanings, values and social practices. Its flexible methods allow for a deeper understanding of the realities investigated.

On the other hand, quantitative research is based on the objective measurement of reality, using instruments capable of producing numerical data that can be statistically analyzed. Its focus is on verifying hypotheses, identifying patterns, and generalizing results, and is widely used in studies that require precision, control, and replicability.

Mixed research, in turn, is configured as an integrative proposal, bringing together the potentialities of qualitative and quantitative approaches. The literature points out that this methodology enables data triangulation, greater analytical richness, and reduction of biases, especially when a single type of data is not sufficient to explain a given phenomenon. Models such as the explanatory sequential, the exploratory sequential and the convergent are often cited as structured forms of articulation of this approach.

When comparing the three methodologies, it is observed that the conceptual confusion between students and researchers is mainly due to the lack of clarity regarding the objectives, characteristics and purposes of each method. It is often mistakenly believed that qualitative and quantitative are hierarchical or exclusionary approaches, when, in reality, they represent different epistemological perspectives for different research problems. The mixed approach, in turn, raises doubts due to the complexity of its application and the requirement for greater methodological mastery.

Thus, the analysis shows that an adequate understanding of the three approaches directly contributes to the coherent methodological choice in academic research, avoiding misunderstandings and strengthening scientific production. The conceptual and technical mastery of these methodologies expands the investigative possibilities and qualifies the results of the research.

5 FINAL CONSIDERATIONS

The present study showed that the qualitative, quantitative and mixed approaches have their own characteristics, distinct epistemological foundations and specific purposes in the field of scientific research. The literature analyzed demonstrates that the conceptual confusions often found in the academic environment are largely due to the superficial understanding of the particularities of each method and the mistaken belief that they are opposite, hierarchical or automatically complementary.

Qualitative research stands out for privileging the deep understanding of social, cultural and subjective phenomena, while quantitative research focuses on the objective measurement of data, the testing of hypotheses and the statistical generalization of results. The mixed methodology, on the other hand, integrates, in a planned and systematic way, elements from both perspectives, with the objective of broadening the understanding of the phenomena investigated, giving greater interpretative robustness to the results.

In this sense, it is essential to highlight that the mere presence of numerical data in a survey is not enough to characterize it as mixed. As stated by Creswell and Plano Clark (2007) and Sampieri, Collado and Lucio (2013), a research can only be considered of a mixed nature when there is intentional, planned and methodologically articulated integration between quantitative and qualitative data, in specific phases of the study (explanatory sequential, exploratory sequential or convergent), from collection to analysis and interpretation of the results.

In many essentially qualitative studies, numerical data may appear with a merely descriptive function, as a way of characterizing the participants, frequency of phenomena or initial organization of the data, without this altering their epistemological nature. In these cases, the numbers do not fulfill an explanatory, inferential or hypothesis testing function, which prevents their classification as mixed research. Thus, the punctual use of numbers in qualitative research does not imply, by itself, the adoption of the mixed methodology.

On the other hand, in mixed research, quantitative data are used for specific purposes, such as expanding the explanation of qualitative results, validating findings, comparing groups, identifying patterns, or producing generalizations that complement interpretative analyses. Likewise, qualitative data play an essential role in understanding the meanings, contexts and experiences underlying the numerical results, configuring a relationship of effective methodological complementarity.

By clarifying these differences, this article contributes to the improvement of the methodological understanding of students and researchers, supporting more coherent choices in the planning and execution of scientific research. It is recommended that future studies deepen this discussion through concrete empirical examples, especially in the field of education, in order to strengthen methodological training and avoid recurrent mistakes in the classification of research approaches.

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