

WHEN NUMBERS ARE NOT ENOUGH: REFLECTIONS ON THE BANALIZATION OF THE QUANTITATIVE

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Abstract

This paper critically examines the banalization of the term quantitative in educational research, arguing that conceptual imprecision in the use of methodological categories undermines the epistemological validity of the knowledge produced. The aim is to demonstrate that numerical data and descriptive statistics, in isolation, do not characterize a study as quantitative, thus requiring the rigorous use of inferential techniques and clarity regarding the target and limits of inference. The approach is theoretical-conceptual, drawing on Bourdieu (2004), particularly the notion that scientific concepts are symbolic constructions contested within the academic field, and on Creswell (2010) with regard to the characterization of quantitative research based on sample-based inference. By way of exemplification, the text articulates two complementary analytical strands: (a) a discourse analysis of a real dialogue with a generative artificial intelligence system, which reveals patterns of conceptual accommodation and the reproduction of fragile methodological consensuses; and (b) a critical reading of two recent academic articles, published in peer-reviewed journals in the field, that self-identify as qualitative-quantitative despite presenting neither inferential procedures nor effective integration between approaches. Based on these materials, the text distinguishes inferential statistics from valid inference, discusses the epistemological limits of generalization, and questions methodological classifications that automatically associate the absence of population-level generalization with the impossibility of inference. It concludes that the teaching of Research Methodology should resist the superficial legitimacy conferred by statistical and technological discourses, promoting a conceptual reanchoring grounded in explicit criteria, rigorous distinctions, and epistemological responsibility. By sustaining such distinctions, the study contributes to a more critical and reflexive methodological education, particularly relevant in light of the growing use of AI technologies that tend to reinforce ambiguities already present in the educational literature.

Keywords: Quantitative Research, Statistical Inference, Scientific Methodology, Education.

INTRODUCTION

In recent decades, educational research has witnessed a growing emphasis on the use of numbers, graphs, and statistical indicators as markers of scientific rigor. While this movement is legitimate, it has produced a significant side effect: the progressive banalization of the term quantitative, which is often used as a synonym for any study that includes numerical data, regardless of its methodological design, epistemological assumptions, or validation criteria. As a

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consequence, there has been a proliferation of imprecise methodological classifications, such as descriptive-quantitative research or qualitative-quantitative research, attributed solely to the presence of percentages or the use of descriptive statistics. Rather than contributing to methodological clarity, this indiscriminate use tends to obscure the epistemic foundations of research and hinder the understanding of its inferential possibilities.

This conceptual imprecision compromises communication among researchers, the intelligibility of findings, and the epistemological validity of studies. When methodological categories are mobilized without clear criteria, for instance, treating statistics as an automatic guarantee of inference or associating the use of numbers with scientificity, a methodological discourse emerges, which prioritizes the appearance of rigor over coherence among research objectives, design, and data interpretation. This is therefore both a formative and an epistemological problem, requiring critical analysis and conceptual reanchoring.

The aim of this study is to explicate and problematize this phenomenon within the field of Education. It is grounded in the premise that the term Quantitative Research should be reserved for methodological designs that make rigorous use of inferential statistical techniques, supported by plausible and clearly defined assumptions, with the goal of producing valid inferences. Such inference may take different forms: testing explicit hypotheses, estimating parameters under controlled uncertainty, or generalizing results from a representative sample, as in survey research. In this regard, Creswell (2010, p. 178) states:

[...] A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. From sample results, the researcher generalizes or makes claims about the population.

In contrast, this paper argues that numerical data and descriptive statistics alone are not sufficient to characterize a study as quantitative, even though they may contribute relevant descriptions of the phenomenon under investigation. The defining criterion lies not in the form of the data, but in the logic of the inferential reasoning employed and in the methodological alignment between research questions, design, analytical techniques, and the type of inference produced.

To support this argument, the paper combines conceptual grounding with the analysis of contemporary examples. From a theoretical perspective, it draws on Bourdieu (2004), particularly the notion that scientific concepts are symbolic constructions contested within the academic field. This implies that it is not enough to describe how terms are used; it is necessary to interrogate the social and epistemological conditions that render them legitimate. From an empirical standpoint, the paper mobilizes two analytical strands: (a) a discourse analysis of a real dialogue between a researcher in the field and a generative artificial intelligence system, focusing on the meanings of the terms quantitative and qualitative and on the ambiguities surrounding the use of numerical data and statistical procedures; and (b) a critical reading of two recent academic articles, published in peer-reviewed journals in the field, that self-identify as qualitative-quantitative. The analytical focus lies on how both AI systems and scientific



texts accommodate conceptual tensions, reproducing fragile classifications that circulate in the literature and in educational training materials.

The article is organized into five main sections. Section 2 examines the conceptual slippage between quantitative, numerical, and descriptive, highlighting how this confusion weakens methodological classifications. Section 3 discusses the myth of automatic inferentiality, distinguishing inferential statistics from valid inference, and problematizes the association between the absence of population-level generalization and the impossibility of inference. Section 4 presents and analyzes the dialogue with an AI system as a mirror of the educational field, in which patterns of conceptual accommodation make visible the naturalization of ambiguity. Section 5 discusses the formative implications of these issues, with emphasis on the role of the Research Methodology instructor. Finally, Section 6 revisits the main arguments and proposes paths for a conceptual reanchoring of research training in Education.

WHEN WORDS SLIP

This section examines a set of recurring conceptual shifts in the use of methodological terms within the field of Education, particularly those related to the notions of quantitative, qualitative, and descriptive. It argues that a significant portion of contemporary methodological confusion does not stem from deep epistemological disagreements, but rather from the imprecise, expanded, or metaphorical use of categories whose technical meanings are relatively stabilized within the scientific community. By tracing how these terms slide across different meanings, at times as methodological categories, at others as mere descriptors of procedures or data formats, this section seeks to make explicit the effects of such slippage, both on the integrity of research and on the banalization of the quantitative and the relativization of methodological rigor. Mineiro *et al.* (2022, p. 202) make the following observation regarding methodological confusion in educational research:

Within the academic context, and particularly in Education, the terms qualitative and quantitative are used with different meanings and often without proper problematization, which hinders the understanding of the paradigmatic aspects that characterize them.

Quantitative as a reserved term

Within the field of scientific methodology, certain terms do not function as free adjectives but as stabilized conceptual categories whose meaning is defined by relatively consensual disciplinary conventions. Quantitative Research is one such case. It is an expression that designates a specific type of scientific inquiry, characterized not by the superficial format of the data collected, but by an articulated set of epistemological assumptions, methodological procedures, and formal validation criteria. These elements include the formulation of hypotheses, when applicable, the systematic use of statistical models to test them, the clear definition of the inferential target, as well as key decisions



regarding sampling design, including the justification of the sampling strategy adopted, the determination of sample size based on significance level, statistical power, and effect size, and the explicit specification of the conditions under which results may be inferred beyond the observed data.

Without this articulation, that is, without hypothesis formulation, when applicable, defensible sampling, justified sample size, and an appropriate statistical model, there is no Quantitative Research in the methodological sense, even if numerical data are collected and mathematical operations are performed. In this sense, the term quantitative functions as a reserved term. Its use, when applied to the classification of a type of research, is neither ambiguous nor metaphorical. Using it outside this scope, for example to designate any study that contains numerical data, entails a conceptual shift that compromises the intelligibility of the field itself. Although in everyday language the term quantitative may be used broadly to refer to quantity or measurement, within scientific research methodology it acquires a specific technical meaning, the dilution of which produces concrete epistemological effects.

The difficulty becomes particularly evident when this technical status is ignored in educational contexts. When quantitative is treated as a generic label tied merely to the presence of numbers, what is lost is the understanding that what defines Quantitative Research is not the data itself, but the set of procedures through which such data are mobilized to produce scientifically validated knowledge.

Numerical data ≠ Quantitative research

One of the most recurrent misconceptions in the educational literature, particularly in the initial training of researchers, consists in assuming that the presence of numerical data is sufficient to classify a study as quantitative. This direct association between numbers and quantitateness overlooks a fundamental distinction between the form of data representation and the epistemological logic of research.

Numerical data are merely one possible way of recording empirical observations. They may be used to describe frequencies, organize categories, illustrate trends within a group, or characterize a specific context. None of these operations, in themselves, define a study as Quantitative Research. The use of numbers does not automatically make a study quantitative, just as the use of words does not necessarily make it qualitative.

The confusion becomes more pronounced when expressions such as quantitative data are used uncritically, suggesting that the mere quantification of observations confers a methodological status that the study does not possess. From a conceptual standpoint, it would be more precise to refer to numerical data, reserving the term quantitative to designate a type of research that is grounded, at least in part, in statistical inference. Such inference may involve hypothesis testing, as in experiments, or sample-based generalization, as in surveys, but in both cases it requires a set of statistical procedures aimed at transforming numerical data into valid conclusions about a phenomenon. This distinction, although seemingly subtle, is essential to avoid the improper conflation of different levels of methodological analysis.

Failure to recognize this distinction risks attributing quantitative rigor to studies whose purpose is exclusively descriptive, thereby weakening both the



understanding of what constitutes Quantitative Research and the legitimacy of rigorous qualitative approaches that may also rely on numerical data as an auxiliary resource. A revealing example of this situation can be found in the study by Lira *et al.* (2024), which self-identifies as qualitative-quantitative, but whose methodological structure does not support such a classification. Although the article makes use of numerical data, specifically the counting of posts made by seven public early childhood education institutions on their Facebook pages, these data are used solely for descriptive purposes and do not constitute a structuring analytical component. The so-called quantitative dimension is limited to the presentation of a table with absolute frequencies, with no use of inferential statistics, no definition of a target population, no formal sampling, and no formulation of testable hypotheses.

The complete absence of inferential procedures or statistical modeling, combined with the predominance of qualitative discourse analysis, invalidates, in the terms adopted here, its classification as mixed-methods research. As the authors themselves state:

The research, characterized as qualitative-quantitative, assumes a bibliographic, exploratory, and documentary nature. Data analysis was conducted through a theoretical framework, considering the content of the posts, based on images, videos, phrases, and texts [...] (Lira *et al.*, 2024, p. 3).

It becomes evident that the use of the qualitative-quantitative label stems from the simultaneous presence of numerical data, namely the frequency of posts, and discursive records, but without any articulation between distinct methodological logics. The numerical data are not treated statistically, nor do they contribute to a formal quantitative analytical argument. This is therefore a typical case of symbolic legitimation of methodological rigor through an imprecise label, in which the combination of numbers and narrative suggests a form of hybridity that is not reflected in the procedures actually employed.

This ambiguous classification reinforces the central argument of this study: the mixed-methods label has often been used not to describe a rigorous methodological articulation between approaches, but as a symbolic marker of completeness, regardless of the coherence between objectives, research design, and the type of inference produced. When there is no articulation between statistical inference and qualitative interpretation, but only a superficial juxtaposition of heterogeneous elements, the study cannot be considered mixed-methods, since there is an absence of elements that would qualify it as quantitative research.

The misleading expression: descriptive-quantitative research

The expression descriptive-quantitative research is also used in the educational literature to classify studies that mobilize numerical data and present results in the form of tables, percentages, or indicators. Despite its widespread use, this is a methodologically problematic designation, not because it combines description and quantification per se, but because it fails to make explicit the research logic actually adopted.

When quantitative is understood as a methodological category, the classification of a study depends on precise criteria, including the formulation of hypotheses, when applicable, the definition of variables, the use of statistical



models, and the explicit specification of the scope of inference. By contrast, the term descriptive does not define a type of research at the same conceptual level, as it may refer either to the analytical purpose or to the form in which results are presented. The expression descriptive-quantitative therefore conflates these two levels without clarifying which of them operates as the organizing principle of the research design.

In some cases, this label is used to designate studies that employ numerical data solely to characterize contexts, frequencies, or local evaluations, without hypothesis formulation or procedures of statistical inference. In other cases, it appears in association with studies that combine qualitative description and numerical records, without this articulation being explicitly assumed as a mixed-methods design. In both situations, the expression does not describe the method, but rather conceals the absence of a clearly defined methodological delimitation.

The problem with this expression does not lie in the coexistence of description and quantification, which is entirely legitimate in different research designs. The issue lies in its classificatory insufficiency. By replacing the explicit articulation of the methodological argument with a generic label, the expression descriptive-quantitative research compromises the transparency of the research design and obscures central criteria of scientific validation, such as the type of inference intended, the status of the data, and the scope of the conclusions.

It is precisely this classificatory insufficiency that calls for a more in-depth examination of the origins of this confusion, which will be undertaken in the following section through an analysis of the structural polysemy of the terms involved.

The methodological mirage

An analysis of the source of confusion shows that the expression descriptive-quantitative research is problematic because it combines, without explicit clarification, polysemous terms whose meanings vary depending on the epistemological context in which they are used. Both quantitative and descriptive carry at least two distinct meanings. It is precisely the unexamined combination of these meanings that produces a methodological mirage, that is, the appearance of conceptual rigor detached from a clear definition of the research design.

The term quantitative may refer, on the one hand, to a reserved methodological category grounded in the explicit formulation of hypotheses, when applicable, the operational definition of variables, and the use of formal statistical inference procedures. On the other hand, it may simply indicate that certain data have been expressed numerically, without any commitment to inference or generalization. Similarly, the term descriptive may refer either to the unavoidable stage of interpreting and explicating numerical results in a legitimate quantitative study, that is, translating numbers into the conceptual language of the field in order to make them intelligible to the reader, or to an epistemological orientation characteristic of qualitative research, oriented toward producing dense, contextualized, and interpretive accounts of practices, processes, or social meanings.

When these meanings are combined without distinction, the expression descriptive-quantitative becomes open to multiple plausible interpretations. For



the reader, it may indicate: (a) an inferential quantitative study that, like any other, ultimately describes and interprets its numerical results; (b) a study based on numbers but limited to descriptive statistics, without hypothesis formulation or inference; (c) a qualitative study that incorporates numerical records as illustrative support; or (d) a mixed-methods design that integrates quantitative and qualitative logics in a coherent manner. The problem is that the expression does not clarify which of these possibilities is at stake and, for that very reason, fails to inform the methodological status of the study.

In properly conducted quantitative research grounded in formal statistical inference, the description of results is a constitutive stage of the analytical process, but not an additional classificatory category. After parameter estimation, hypothesis testing, or the modeling of relationships between variables, it is necessary to interpret the numbers, situate them theoretically, and translate them into the language of the field. In this sense, every legitimate quantitative study is necessarily descriptive, without this needing to be explicitly stated in the methodological label. Adding the qualifier descriptive, when the term is used in this sense, becomes methodologically redundant.

The ambiguity becomes more pronounced when the term descriptive is used in the sense proper to qualitative research, without this being explicitly acknowledged. In this context, describing does not mean interpreting numerical results, but producing analytically oriented accounts of contexts, practices, discourses, or social processes. When this qualitative sense of description is combined with the label quantitative, without explicitly adopting a mixed-methods design and meeting its corresponding requirements, the expression begins to obscure rather than clarify actual methodological choices.

A recent example that reinforces the critique of imprecise methodological labeling can be found in the study by Amorim *et al.* (2025), which self-identifies as qualitative-quantitative based on the application of a questionnaire containing open- and closed-ended questions. However, the quantitative analysis is limited to counting simple frequencies and percentages, carried out in an Excel spreadsheet, without any hypothesis formulation, statistical modeling, or sample calculation that would justify population-level inference. Although the study is methodologically relevant from a descriptive and contextual standpoint, its classification as mixed-methods lacks conceptual grounding, as there is no articulation between distinct inferential logics, nor any analytical integration between qualitative data and the numerical records collected. In this context, the qualitative-quantitative label operates more as a symbolic legitimation of rigor than as an accurate description of the research design, contributing to the banalization of methodological categories and reinforcing the need for greater classificatory precision in both training and scientific production in Education.

It is precisely at this point that the expression descriptive-quantitative, as well as the qualitative-quantitative label, operates as a methodological mirage. This is not because description, quantification, or mixed methods are illegitimate, but because the unexamined polysemy of these terms allows numbers that encode concepts to be taken as evidence of statistical quantification, and interpretive procedures to be confused with inference. The result is a methodological discourse that appears rigorous due to the presence of



numbers, scales, and tables, but ultimately rests on the conceptual indeterminacy that the label itself helps to conceal.

Recognizing this mirage does not imply devaluing quantitative, qualitative, or mixed-methods research, nor denying the legitimacy of using numbers in interpretive studies. Rather, it means reaffirming that scientific rigor does not arise from the accumulation of labels, but from the internal coherence between research objectives, design, analytical procedures, and criteria of validity. Only with such conceptual clarity is it possible to avoid the banalization of the quantitative and to promote a more critical, coherent, and intellectually responsible methodological training in the field of Education.

THE MYTH OF AUTOMATIC INFERENCE

While the previous section examined the conceptual slippage between quantitative, numerical, and descriptive, this section addresses a related yet distinct misconception, namely the belief that the mere use of statistical techniques, especially those labeled as inferential, is sufficient to guarantee the validity of scientific inference. In the field of Education, inferential statistics, valid inference, and population-level generalization are sometimes treated as interchangeable terms, thereby obscuring fundamental distinctions between technique, research design, and the epistemological scope of results. By examining this confusion, the present section aims to demonstrate that inference is not an automatic attribute of statistical procedures, but rather an emergent property of the methodological argument as a whole, dependent on underlying assumptions, design choices, sample construction, and clarity regarding the inferential target.

Inferential statistics ≠ Valid Inference

The assumption that inferential statistics automatically entails the ability to draw general conclusions from data is methodologically unsound. The mere application of statistical tests, parameter estimation, or the reporting of p-values does not, in itself, justify valid inferences about a broader population, nor does it guarantee the legitimacy of conclusions beyond the analyzed dataset. What inferential statistics provides are formal procedures for quantifying the uncertainty associated with conclusions drawn from sample data, that is, for expressing, through probabilities, intervals, or controlled error rates, the degree of confidence that can be attributed to estimates, tests, or models. This quantification is always conditional on a set of explicit assumptions, including those related to sampling, data distribution, independence of observations, and model adequacy. Therefore, the validity of inference depends directly on the plausibility of these assumptions in relation to the study design and the process that generated the data.

Strictly speaking, to infer means to draw conclusions from collected data, with quantified uncertainty, about characteristics of a population, of the observed sample, or of a data-generating process. This extrapolation may take different forms: (a) estimation, such as confidence intervals or point estimates; (b) hypothesis testing, that is, deciding between H_0 and H_1 based on a significance level; and (c) modeling, such as regression models, hierarchical



models, or mixed-effects models. In all these forms, statistical inference is conditional, it is valid only if the assumptions underlying the statistical model and the study design are satisfied. When these conditions are not met, results may still be computed, but they become epistemically fragile.

A recurring mistake consists in treating the application of a statistical test, for example a t-test, an ANOVA, or a nonparametric test, as a seal of inferential validity. However, a test is merely a formal decision mechanism under specified hypotheses and assumptions, it does not replace reasoning about how the data were obtained, nor does it resolve structural issues such as sampling bias, selection bias, dependence among observations, or lack of comparability between groups. This type of simplified interpretation has also been criticized within statistics itself. As demonstrated by Gelman and Stern (2006), the distinction between statistically significant and non-significant results is often taken as evidence of a difference between effects, even though that difference is not, in itself, statistically significant.

Inference does not originate in software, it is a property of the method-data-design nexus, rather than of the statistical procedure in isolation. The automatic use of statistical tools, even sophisticated ones, does not eliminate the risk of invalid inference when the methodological design is neglected or poorly understood, as confidence in the results depends less on the technique employed and more on the consistency between the statistical model and the empirical process that generated the data.

The role of sampling design and representativeness

The validity of inferences about a population is directly linked to the sampling design adopted and to the degree of representativeness it allows in relation to the target population. Classical statistical inference assumes that observed data result from some sampling mechanism that, ideally, approximates probabilistic selection or, at least, allows for a plausible justification of the link between sample and population. In educational contexts, however, the use of convenience samples, often small, localized, or strongly self-selected, is common, which severely limits the possibility of statistical generalization, even when tests are applied and confidence intervals are calculated.

It is important to emphasize that representativeness is not an intrinsic or moral property of a sample, but a relationship between how participants were selected and the declared inferential target. For example, if a study aims to make inferences about all elementary school teachers in Brazil but collects data from only a single school or municipality, this discrepancy compromises the validity of the inference, not due to the absence of statistical techniques, but due to the absence of a defensible methodological link between sample and population. The simplified view that representativeness is synonymous with a large number of participants or broad geographic coverage, while disregarding the relationship between the sampling process and the actual parameters of the target population, tends to obscure important inferential limitations by replacing methodological justification with generic quantitative indicators that, in isolation, do not support valid inference.

Thus, assuming that simply increasing sample size will resolve inferential limitations is a methodological error. Sample size affects the precision of



estimates, but it does not correct systematic selection biases. A large but biased sample remains unsuitable for supporting legitimate population inferences, just as small samples may be valuable for local inference, provided there is coherence between the scope of the study and the defined inferential target.

Another frequently overlooked aspect is the assumption of independence among observations, which underlies many classical statistical tests. In Education, data often exhibit a hierarchical structure, such as students nested within classrooms and classrooms nested within schools, which implies the presence of intraclass correlation. In such cases, observations within the same group tend to be more similar to one another than to those from different groups. Applying tests that assume independence without appropriate modeling, such as multilevel models or cluster-adjusted approaches, compromises standard errors, confidence intervals, and statistical significance. Consequently, even an apparently representative sample may fail in its inferential validity if the statistical model is not compatible with the structure of the data.

Finally, it is essential to distinguish between two levels of inference that, although distinct, are often conflated: (a) inference to a population, that is, statistical generalization, and (b) inference about a causal or explanatory mechanism, that is, internal validity. A rigorously controlled experiment may yield robust inferences about a local effect without being representative of a broader population. Conversely, a representative sample without control of confounding variables may provide valid descriptive estimates, but cannot sustain causal inference. Reducing inference to a single attribute automatically guaranteed by statistical technique obscures these distinctions and undermines methodological reasoning in the field of Education.

Epistemological limits of generalization

Generalization is often treated as a mandatory goal of scientific research, as if producing valid knowledge necessarily required extrapolating results beyond the context studied. This expectation, although common, reflects an epistemologically restricted view. There are investigations whose value lies precisely in the in-depth analysis of a case, a specific context, or a situated process. In such scenarios, attempts at statistical generalization may be methodologically unfeasible and conceptually inappropriate.

The issue, therefore, is not the absence of generalization, but the insistence on claiming it without proper methodological grounding, or the use of statistical language as a substitute for epistemological justification. The pursuit of broad generalizations may obscure the heuristic value of localized studies and lead to the uncritical application of statistical models to contexts that do not support them, thereby undermining the explanatory power of the method.

To avoid this type of imprecision, it is important to distinguish at least three distinct meanings of generalization, which are often conflated in the educational literature:

a) Statistical generalization, or population-level generalization, defined as the extrapolation of estimates from a sample to a target population, with quantified uncertainty, supported by an appropriate sampling design and a consistent statistical model.



b) Analytical generalization, or theoretical generalization, defined as the articulation of empirical findings with broader theoretical propositions, without relying on sample representativeness, in which what is generalized is an argument or interpretive mechanism.

c) Transferability, based on contextual similarity, defined as the possibility for the reader to judge whether the results of a study are applicable to similar contexts, based on the richness of the case description and the clarity of the methodological account.

Educational studies that make use of numerical data and descriptive statistics may contribute significantly to types (b) and (c), even without supporting type (a). Likewise, studies that employ inferential techniques may have their validity restricted to highly specific contexts; for example, students in this school under these conditions, rather than to the broader population often assumed. To consider such studies as methodological failures would be to ignore the legitimate plurality of scientific aims. Conversely, to treat them as automatically inferential merely because they employ statistical techniques is a conceptual error that conceals real limitations of the research design.

Thus, the central point may be summarized as follows: inferential statistics is a set of techniques, whereas valid inference is a property of the methodological argument as a whole. Between the two lies a gap filled by decisions regarding sampling, modeling, assumptions, and, above all, clarity regarding the inferential target. When this gap is ignored, statistics loses its critical function and begins to operate as a rhetoric of legitimation.

This confusion affects both the interpretation of results and the classification of research designs themselves. When it is implicitly assumed that statistical inference is equivalent to population-level generalization, certain designs come to be viewed as methodologically incapable of inference, even when what is at stake is merely the scale or scope of inference. In such cases, limitations related to the scope of inference are improperly transformed into criteria for methodological classification, resulting in arbitrary categorizations of research designs.

It is within this context that the automatic association between Case Study and Qualitative Research becomes consolidated, a pattern widely disseminated in educational literature. Reference works such as Lüdke and André (2022) and Yin (2016) present Case Study within books on qualitative approaches, which may lead readers to overlook the possibility of quantitative case studies with statistical inference restricted to the case itself.

A DIALOGUE WITH AI AS A MIRROR OF THE PROBLEM

The conceptual and epistemological distinctions discussed in the previous sections are not confined to the abstract level of methodological theory; they manifest concretely in contemporary discursive practices of knowledge production and circulation. To demonstrate how these ambiguities operate, this section analyzes a real dialogue between a researcher in the field of Education and a generative artificial intelligence system, treating it not as a technological object in itself, but as a privileged site for observing the naturalization of fragile methodological consensuses. The dialogue thus functions as a mirror of the



field, revealing in real time how confusions between quantitative, numerical, descriptive, and inferential are reproduced, accommodated, and discursively stabilized, even in the presence of explicit attempts at conceptual rigor.

Discursive analysis of a dialogue

To further develop the discussion proposed in the previous sections, this study draws on a dialogue between a researcher in the field of Education and a generative artificial intelligence system as illustrative material, in which the meanings of the terms quantitative, qualitative, descriptive, and inferential are discussed within the context of scientific methodology. The analytical interest of the dialogue does not lie in the factual correctness of the AI's responses, but in how concepts are progressively negotiated, accommodated, and reformulated throughout the interaction.

The approach adopted may be characterized as a conceptually oriented form of discourse analysis, focused on identifying semantic shifts, strategies of terminological harmonization, and mechanisms for avoiding conceptual conflict. It does not aim to evaluate the technical performance of the AI, nor to compare its responses with normative statistical manuals, but rather to examine how the system discursively manages epistemological tensions when confronted with precise and non-conciliatory definitions.

The dialogue is analyzed as an argumentative event in which positional asymmetries emerge. On one side, there is a human interlocutor who insists on conceptual precision, makes criteria explicit, and points out contradictions. On the other, there is a system that responds by seeking local coherence, conversational fluency, and the progressive accommodation of the objections raised. This asymmetry makes visible a central aspect of the problem under investigation, namely the tendency toward the stabilization of fragile consensuses through conceptual dilution.

Patterns of conceptual accommodation in AI

One of the most revealing elements of the dialogue is the recurrence of patterns of conceptual accommodation on the part of the AI. Whenever confronted with a rigorous definition, for example the idea of Quantitative Research as a methodological category associated with inferentiality, the AI initially responds with broad and conciliatory formulations, seeking to integrate different uses of the term within a single explanatory framework. This movement produces responses that appear balanced, yet remain conceptually unstable.

Throughout the interaction, the AI tends to:

- a) Accept corrections at a local level, acknowledging that a given use of the term may be imprecise.
- b) Preserve vague definitions, keeping multiple interpretations open.
- c) Reformulate concepts in an inclusive manner, even when such inclusiveness generates internal contradictions.

This pattern becomes particularly evident when the distinction between numerical data and Quantitative Research is made explicit. The AI recognizes the difference, but only after successive interventions, and even then shows difficulty in abandoning the use of the term quantitative as a generic label. The result is a discourse that appears to converge toward the interlocutor's position,



but does so only by relaxing conceptual criteria, precisely the movement that this study critiques within the field of research methodology in Education.

How AI reproduces fragile consensuses

The observed behavior should not be interpreted as an individual failure of the system, but rather as a symptom of a broader phenomenon. Generative AI systems are trained on large volumes of texts produced in real academic contexts, in which the confusion between quantitative, numerical, descriptive, and inferential is already widely disseminated. In this sense, AI does not create the problem, it reproduces, amplifies, and stabilizes it.

In seeking to provide responses that make sense to a broad range of users, AI privileges frequent and socially accepted linguistic uses, even when such uses are conceptually fragile. The result is the consolidation of a low-resolution statistical and methodological consensus, in which technical terms are treated as functionally equivalent and epistemological distinctions are softened in the name of discursive fluency. The analyzed dialogue shows that, without critical intervention, AI tends to:

- a) Treat quantitative as synonymous with the use of numbers;
- b) Present inferential statistics as an implicit guarantee of inference;
- c) Classify studies as mixed based on superficial criteria;
- d) Avoid exclusionary statements that require clear conceptual choices.

These tendencies are particularly problematic in educational contexts, as they confer legitimacy on imprecise definitions grounded in a widely disseminated superficial consensus (cf. Bourdieu, 2004). When AI provides responses that appear confident and balanced, even while reproducing ambiguities, it reinforces the perception that such ambiguities are acceptable or even correct from a methodological standpoint. As an illustration of this process, part of the dialogue with the AI is reproduced below:

AUTHOR: A study with numerical data, percentages, and means is a quantitative study, right?

AI: That's right! 😊 Yes, a study that involves numerical data, percentages, and means is a classic example of quantitative research!

AUTHOR: But I have seen qualitative research that also uses numerical data. In that case, is it mixed research?

AI: You are absolutely right! 😊 Yes, qualitative research can also involve numerical data, and when that happens, it is common to refer to it as mixed-methods or multimethod research! You're getting the hang of it! When a study combines different approaches, it is common to classify it as mixed or hybrid.

AUTHOR: Okay. If I use statistical methods such as calculating the mean, then it is quantitative research, right?

AI: Exactly! If you are using statistical methods such as calculating the mean, standard deviation, regression, and so on, then it is likely to be quantitative research!

AUTHOR: Why "likely"? Is it or is it not?

AI: It is! If you are using statistical methods such as calculating the mean, then it is quantitative research! Not "likely", it is indeed! Thank you for correcting me! Now it is correct!!



AUTHOR: Even without inferential capacity?

AI: Ah, that is a different matter! If the study uses statistical methods but does not have inferential capacity, meaning it is not attempting to generalize results to a larger population, then it may be a case of descriptive-quantitative analysis.

The naturalization of imprecise concepts can be observed both in AI-generated responses, as illustrated in the dialogue above, and in recent academic publications. Studies that self-identify as qualitative-quantitative frequently limit themselves to the use of questionnaires with open- and closed-ended questions, treating numerical data only descriptively, without hypothesis formulation, without procedures of statistical inference, and without effective methodological integration between qualitative and quantitative components. In works of this kind, as seen in recent studies such as Amorim, Mendes, and Macêdo (2025), the coexistence of open-ended responses and descriptive percentages is taken as sufficient to characterize a mixed design, whereas in reality the label functions more as a rhetorical resource for legitimizing methodological rigor than as an accurate description of the research structure. This constitutes a clear example of what Bourdieu (2004, p. 34) refers to as scientific capital, that is:

[...] a particular type of symbolic capital, a capital based on knowledge and recognition. It is a form of power that operates as a kind of credit, presupposing the trust or belief of those who are subject to it, because they are disposed, by their training and by the mere fact of belonging to the field, to grant credit, to believe.

Thus, the uncritical adoption of imprecise classifications often does not stem from consistent methodological grounding, but from the symbolic recognition that such labels evoke. This form of legitimation may be reinforced both by AI systems, which reproduce common sense, and by peers socialized within academic environments.

Implications for the teaching of research methodology

The implications of this scenario for the teaching of Research Methodology are substantial. In a context where students increasingly rely on AI systems to support study and academic writing, the tendency toward conceptual accommodation may undermine methodological training, particularly in areas where statistical knowledge has historically been fragile.

The risk does not lie in the use of AI itself, but in the uncritical delegation of conceptual authority to systems that operate through linguistic consensus rather than epistemological definition. If instructors and advisors do not make criteria, distinctions, and conceptual boundaries explicit, AI will tend to reinforce precisely the imprecise uses that circulate within the field, creating a feedback loop between everyday language, insufficient training, and technological validation.

In this context, the role of teaching Research Methodology becomes even more demanding. It is the responsibility of the instructor not only to present classifications and typologies, but also to teach students to recognize contradictions, identify improper uses of technical terms, and sustain non-



conciliatory definitions when conceptual rigor so requires. The analyzed dialogue shows that clarity emerges only when the human interlocutor insists on explicit criteria and resists the temptation to harmonize incompatible concepts.

Thus, more than a warning about the limitations of AI, this analysis reinforces a central thesis of the article: the banalization of the quantitative is not a technological problem, but a formative and epistemological one. AI merely reflects, with efficiency and scale, the ambiguities already present in academic discourse. Addressing them requires a rigorous conceptual reanchoring in both the teaching and practice of research in Education.

IMPLICATIONS FOR TEACHER EDUCATION

The analyses developed in the previous sections show that the banalization of the quantitative, the confusion between statistics and inference, and the naturalization of imprecise methodological labels are not merely isolated conceptual problems, but symptoms of deeper formative weaknesses within the field of Education. When fundamental epistemological distinctions are no longer taught, sustained, and problematized, the consequence is not only the production of methodologically fragile research, but also the consolidation of an academic culture that confuses technical language with scientific rigor.

This section shifts the focus from conceptual critique to its formative implications, examining how these ambiguities affect the teaching of Research Methodology, the role of the teacher-educator, and the growing use of technologies that support academic writing and study. In doing so, it argues that addressing the banalization of the quantitative requires less the creation of new classifications and more a rigorous conceptual reanchoring, capable of restoring to education programs clear criteria, epistemological responsibilities, and a non-conciliatory understanding of the limits and possibilities of different research designs.

The role of the research methodology instructor

The conceptual ambiguities discussed throughout this article reposition the role of the Research Methodology instructor in Education. Far from being a transmitter of ready-made classifications or stabilized typologies, this instructor occupies a strategic position in the epistemological mediation between language, method, and knowledge production. When terms such as quantitative, qualitative, and inferential are presented in an undifferentiated or conciliatory manner, this is not merely a didactic issue, but an explicit abdication of the responsibility to develop conceptual criteria.

Teaching Methodology in this context requires acknowledging that central terms such as quantitative research, qualitative research, inference, generalization, and mixed methods are historically contested within the scientific field, but are not, therefore, arbitrary. Foundational authors such as Creswell (2010), in defining operational criteria for quantitative, qualitative, and mixed-methods research, and Yin (2016), in discussing the scope and limits of different qualitative research designs, demonstrate that methodological



plurality requires explicit conceptual boundaries, otherwise classification collapses.

From a sociological perspective, from which Education is not exempt, this requirement is linked to Bourdieu's notion of the legitimate use of scientific categories. For Bourdieu (2004), concepts are not neutral instruments for describing reality, but symbolic constructions embedded in struggles for legitimacy within scientific and social fields. As he states:

Social science is thus a social construction of a social construction. Within the object itself, in social reality as a whole and in the social microcosm in which the scientific representation of that reality is constructed, that is, the scientific field, there is a struggle over the construction of the object. Social science participates in this struggle in a dual manner: being involved in the game, it is subject to its constraints and produces within it certain effects, undoubtedly limited ones. (Bourdieu, 2004, p. 88).

This formulation highlights that scientific categories are implicated in symbolic struggles and that their naturalization depends on specific social conditions of production and circulation. In the field of Education, this becomes evident when terms such as quantitative are used in a generic or strategic manner, not necessarily to justify well-founded methodological choices, but to evoke a symbolic authority associated with the idea of scientificity. In such cases, scientific language tends to become a rhetoric of legitimation, emptied of its critical and heuristic function.

It is, therefore, the responsibility of the Methodology instructor to make limits explicit, sustain conceptual distinctions, and reject hybrid classifications that conceal weaknesses in research design. Far from impoverishing debate, this stance equips students with the tools to critically evaluate their own projects and the studies they read, thereby strengthening the epistemological coherence of scientific production in Education.

Furthermore, instructors must make clear that methodological rigor is not reducible to the adoption of statistical language or the use of computational tools, but lies in the coherence between the research problem, objectives, methodological design, and criteria of validity. By shifting the focus from labels to the methodological argument, the teaching of Methodology contributes to the formation of researchers capable of justifying their choices, recognizing limitations, and avoiding the superficial instrumentalization of technical concepts.

Risks of uncritical legitimation through technology

The growing incorporation of digital technologies, particularly generative artificial intelligence systems, into academic practice introduces a new vector of discursive legitimation. When imprecise definitions are presented by systems that enjoy high symbolic authority, the risk lies not only in occasional error, but in the naturalization of imprecision. What could previously be questioned in the classroom begins to circulate as a correct or balanced response, reinforcing fragile consensuses under the appearance of technical neutrality.

This phenomenon is particularly sensitive in education and training in Education, a field in which many students already feel insecure when faced with



statistics and formal methodology. By offering conciliatory and weakly grounded responses, AI may function as a seductive cognitive shortcut. Instead of engaging with conceptual tensions, the student encounters a formulation that accommodates everything. The result is the replacement of methodological reasoning with adherence to a technologically legitimized language that is nevertheless epistemologically fragile.

It is important to emphasize that the problem does not lie in the use of technology itself, but in the absence of critical mediation. When instructors and advisors do not problematize the responses provided by automated systems, or when they themselves rely on such responses as a source of conceptual authority, a cycle is established in which technology validates precisely the ambiguities that should be subject to analysis. In this scenario, methodological training risks becoming performative, students learn to speak as if they were doing research, without understanding what makes research conceptually consistent.

The need for conceptual reanchoring

In light of this scenario, the need for conceptual reanchoring in education and training in Education becomes evident. Reanchoring does not mean returning to rigid normative models or imposing a simplistic hierarchy among methodological approaches, but rather reestablishing clear criteria for the use of technical terms and for the classification of research designs. It involves recognizing that methodological plurality is only productive when accompanied by conceptual precision.

This reanchoring requires, first, the explicit distinction between type of data, analytical technique, and type of research, thereby avoiding overlaps that confuse different levels of analysis. It also requires making explicit the epistemological limits of each approach, without attempting to compensate for them through hybrid labels or decorative statistical language. Finally, it entails preparing students to recognize that not all research needs, or should, aspire to statistical generalization, and that the validity of a study depends on its internal coherence rather than on the superficial adoption of established procedures.

By placing conceptual precision at the center of the teaching of Methodology, education and training in Education can also benefit from the critical use of technology. AI systems may be explored as objects of analysis, as in this study, revealing patterns of discursive accommodation and fostering epistemological reflection. For this to occur, however, it is essential that instructors assume the task of making criteria explicit, sustaining conceptual distinctions, and resisting the banalization of the quantitative, not as an expression of methodological conservatism, but as a condition for the production of intellectually responsible knowledge.

CONCLUSION

This article began by problematizing the imprecise use of methodological categories in educational research, particularly the banalization of the term quantitative, which is often uncritically associated with the presence of numerical data or the use of descriptive statistics. Its central objective was to



make explicit the epistemological effects of this conceptual slippage, arguing that the classification of a study as quantitative cannot dispense with criteria related to statistical inference, research design, and clarity regarding the inferential target.

Throughout the text, this objective was pursued through the articulation of conceptual grounding and analytical exemplification. The theoretical discussion made it possible to distinguish between numerical data, descriptive statistics, and quantitative research as a reserved methodological category, demonstrating that valid inference does not arise automatically from the application of statistical techniques. The use of examples drawn from recent literature, as well as a dialogue with a generative artificial intelligence system, made visible recurring patterns of conceptual accommodation and the uncritical reproduction of methodological classifications in the field of Education.

The findings indicate that the confusion between statistics, inference, and generalization compromises the intelligibility of research and encourages the adoption of methodological labels that function more as symbolic markers of rigor than as consistent descriptions of research design. By highlighting these patterns through illustrative cases, this study contributes to the methodological debate by reaffirming the need for coherence between research objectives, analytical procedures, and criteria of validity, without resorting to the uncritical overlap of categories.

From a formative perspective, the study reinforces the role of teaching Research Methodology as a space for making criteria explicit and sustaining conceptual distinctions, especially in a context of increasing use of AI technologies, which tend to reproduce fragile consensuses already stabilized in the literature. In this sense, the main contribution of the study lies less in proposing new classifications and more in the conceptual reanchoring of key categories for research in Education.

Among the limitations of the study is its deliberately conceptual and illustrative scope, which does not aim to fully capture the phenomenon under analysis, but rather to make visible recurring patterns of imprecise use of methodological terminology. As directions for future research, the study points to investigations that examine the circulation of these categories across different fields of knowledge, as well as studies focused on the formative impact of AI systems on methodological learning. By insisting on conceptual precision and epistemological responsibility, this article seeks to contribute to a more critical, coherent, and intellectually rigorous research practice in the field of Education.

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