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THE DECLINING RELEVANCE OF HYPOTHESES IN CONTEMPORARY RESEARCH: TOWARD FLEXIBLE, EXPLORATORY, AND DATA-DRIVEN INQUIRY

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Abstract:
For decades, the hypothesis has occupied a central position in research methodology, particularly within positivist and hypothetico-deductive traditions. Historically, research quality was frequently judged by the formulation and testing of hypotheses through empirical procedures. However, contemporary developments in qualitative inquiry, mixed methods research, grounded theory, big data analytics, complexity theory, pragmatism, and post-positivist philosophy increasingly challenge the necessity of hypotheses as a universal requirement. This paper presents a meta-analytic and philosophical argument that the traditional hypothesis is no longer indispensable in modern scholarship and, in many contexts, has become methodologically restrictive. Drawing from methodological literature across the social sciences, education, philosophy of science, qualitative inquiry, and data science, this study demonstrates that many contemporary research designs operate effectively without formal hypotheses. The paper proposes alternative frameworks for conducting rigorous research without hypotheses, including exploratory research questions, abductive reasoning, grounded theory, thematic inquiry, emergent design, and data-driven discovery models. The paper concludes that while hypotheses remain useful in some experimental and confirmatory studies, they should no longer be treated as mandatory components of all scholarly research.

Keywords: hypothesis, research methodology, grounded theory, exploratory research, post-positivism, qualitative inquiry, abductive reasoning, emergent research design, data-driven research

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1. Introduction

The concept of the hypothesis has historically occupied a foundational place in scientific inquiry. Rooted in positivism and the hypothetico-deductive model, hypotheses have been viewed as essential tools for predicting relationships among variables and guiding empirical verification. In classical scientific traditions, researchers formulated hypotheses prior to data collection, thereby ensuring objectivity, replicability, and statistical testing. This approach was predicated on the belief that science advances through the verification or falsification of specific predictions.

However, the evolution of research paradigms in the twentieth and twenty-first centuries has significantly challenged this orthodoxy. Contemporary scholarship increasingly recognizes that not all forms of inquiry are predictive, linear, or deductive. Many modern studies prioritize understanding, interpretation, exploration, emergence, and contextual meaning over mere hypothesis testing. Consequently, the traditional insistence on hypotheses has become problematic, particularly in qualitative, interpretivist, constructivist, pragmatic, and interdisciplinary research traditions. This paper argues that the hypothesis, although historically significant, is no longer universally relevant and should cease to be treated as a compulsory element in research methodology. Instead, research should prioritize flexible inquiry structures capable of accommodating complexity, uncertainty, emergence, and evolving knowledge systems.

2. Historical Foundations of the Hypothesis

The modern hypothesis emerged from positivist philosophy associated with thinkers such as Auguste Comte, Karl Popper, and the logical empiricists of the nineteenth and twentieth centuries. Positivism assumed that scientific knowledge develops through objective observation, measurable variables, and falsifiable propositions. Under this framework, the hypothetico-deductive model dominated scientific inquiry by requiring researchers to formulate hypotheses, collect empirical data, test hypotheses statistically, and accept or reject propositions. This model became especially influential in psychology, the natural sciences, education, and quantitative social science research.

This traditional model relies on several key assumptions: that variables are stable, that causal relations are predictable, that reality is objective, and that knowledge production is linear. However, these assumptions have become difficult to sustain in the face of contemporary complex social realities. Furthermore, the Duhem–Quine thesis weakened confidence in pure hypothesis testing by arguing that hypotheses can never be tested in isolation because empirical testing always involves auxiliary assumptions (Zanotti, 2004). Consequently, the deterministic nature of the traditional hypothesis is increasingly viewed as insufficient for capturing the nuance of modern scientific inquiry.

3. Literature Review

3.1 Positivism and the Traditional Hypothesis

Positivist inquiry views hypotheses as central instruments for scientific verification. Under this framework, theories produce testable predictions which empirical observations either confirm or falsify; thus, hypothesis testing became synonymous with scientific rigor. However, several scholars have criticized this rigid framework. For instance, Avis (2003) argued that rigorous empirical investigation does not necessarily require formal methodological theories or rigid positivist assumptions. Similarly, contemporary critiques of null hypothesis significance testing reveal that many hypothesis-testing procedures are logically inconsistent and frequently misunderstood (Schneider, 2015).

Research in statistics and methodology further demonstrates that confirmatory research often disguises exploratory practices as hypothesis testing (Jun, Birchfield, de Moura, Heer, & Just, 2021). This suggests that the strict dichotomy between exploratory and confirmatory research is often blurred in practice. Moreover, Bonell and Moore (2018) have questioned whether even randomized controlled trials—the gold standard of positivist research—strictly adhere to a positivist ontology, suggesting a methodological flexibility that undermines the absolute necessity of the hypothesis.

3.2 The Rise of Exploratory and Emergent Research

The emergence of qualitative research profoundly challenged the universality of hypotheses. Grounded theory, developed by Barney Glaser and Anselm Strauss (1967), emphasized theory generation from data rather than the testing of predetermined assumptions. Grounded theory researchers argue that hypotheses imposed before data collection may distort emergent meanings and suppress discovery (Hernandez, 2008). Contemporary grounded theory scholars maintain that inductive and constructivist inquiry depends on openness rather than prediction (Timonen, Foley, & Conlon, 2018).

Levers (2013) notes that emergence in grounded theory operates through a dynamic interaction between data and theory rather than through predetermined hypotheses. Similarly, Amsteus (2014) argues that strict *a priori* procedures may undermine authentic inductive inquiry and that methodological flexibility is often more valuable than rigid adherence to predetermined hypotheses. These perspectives highlight the limitations of the hypothesis in environments where the research goal is to generate new theory rather than validate existing constructs.

3.3 Post-Positivism and the Collapse of Certainty

Post-positivism rejects the positivist assumption that researchers can achieve complete objectivity. Instead, knowledge is viewed as provisional, contextual, and socially constructed. This paradigm shift weakened the necessity of hypotheses because reality became viewed as multiple rather than singular, interpretation became central, and inquiry became iterative rather than linear.

Discussions within post-positivism emphasize that all research methods contain assumptions and limitations that make absolute certainty impossible (Åge, 2011). Consequently, modern research increasingly values reflexivity, interpretation, contextualization, and emergence over strict hypothesis testing. In this context, the hypothesis is often viewed as a heuristic that may suggest a direction but should not constrain the inquiry.

3.4 Big Data and Data-Driven Discovery

The rise of artificial intelligence, machine learning, and big data analytics has further marginalized traditional hypotheses. In many contemporary computational studies, patterns emerge from datasets before theories or hypotheses are formulated. Data mining, predictive analytics, and unsupervised machine learning often function without prior hypotheses; instead, algorithms identify relationships inductively. This represents a major epistemological shift: whereas classical research moved from theory to data, modern data science often moves from data to theory (Jun *et al.*, 2021). Hypothesis-free discovery is therefore becoming increasingly common in scientific practice, challenging the traditional linear model of research.

4. Critique of Hypothesis-Based Research

4.1 Restriction of Inquiry

Hypotheses may narrow researchers' perspectives by forcing inquiry into predetermined categories. This can suppress unexpected findings, encourage confirmation bias, and limit creativity. Exploratory inquiry thrives when researchers remain open to emergent patterns rather than attempting to confirm pre-existing assumptions (Amsteus, 2014). By defining the scope of inquiry in advance, hypotheses may prevent researchers from identifying anomalies or novel phenomena that fall outside the predicted framework.

4.2 Artificial Certainty

Many hypotheses imply causal certainty in situations characterized by ambiguity and complexity. Human behavior, culture, education, politics, and social interactions often resist simplistic variable relationships. Consequently, hypothesis testing may oversimplify reality by forcing complex, non-linear phenomena into binary outcomes of "reject" or "fail to reject" the null hypothesis. Schneider (2015) notes that the mechanical application of significance testing often ignores the substantive meaning of the data, creating an illusion of certainty that is not supported by the complexity of the phenomena under study.

4.3 Encouragement of Statistical Ritualism

Critics of null hypothesis significance testing argue that many researchers misuse statistical procedures mechanically without meaningful theoretical understanding (Schneider, 2015). The obsession with "significant results" has contributed to *p*-hacking,

replication crises, publication bias, and superficial statistical reasoning. When the hypothesis becomes the primary goal of research, the process may devolve into a ritual of achieving statistical significance rather than a genuine pursuit of knowledge.

4.4 Incompatibility with Qualitative Inquiry

Interpretivist and phenomenological research aim to understand meaning rather than predict outcomes. In such studies, hypotheses can undermine authentic engagement with participants' experiences. Grounded theory scholars explicitly reject premature hypothesis formulation because theory should emerge from data (Glaser & Strauss, 1967; Hernandez, 2008). In these contexts, the hypothesis acts as a lens that may distort the researcher's ability to see the phenomenon as it is experienced by the participant.

4.5 Complexity and Nonlinearity

Modern systems theory demonstrates that social and natural systems are nonlinear and dynamic. In such systems, causality is multidirectional, outcomes are emergent, and variables constantly interact. Hypothesis testing based on linear assumptions becomes increasingly inadequate when dealing with complex adaptive systems where small changes can have large, unpredictable effects.

5. Methodological Alternatives: Conducting Research Without Hypotheses

5.1 Research Questions Instead of Hypotheses

Researchers can frame studies using open-ended research questions that encourage exploration rather than premature prediction. For example, asking "How do teachers experience competency-based education?" or "What factors shape student motivation?" allows for a broader investigation of phenomena than a hypothesis predicting a specific relationship between two variables. Research questions prioritize the discovery of processes and meanings over the confirmation of specific predictions.

5.2 Grounded Theory

Grounded theory generates theory inductively from empirical data. Researchers collect data, code emerging themes, compare categories, and construct theoretical explanations progressively. This approach allows findings to emerge organically from participants' realities (Glaser & Strauss, 1967; Timonen *et al.*, 2018). By delaying the formulation of propositions until after data analysis, grounded theory ensures that the resulting theory is grounded in the data rather than imposed upon it.

5.3 Phenomenological Inquiry and Ethnography

Phenomenology investigates lived experiences without imposing prior assumptions. Rather than testing hypotheses, researchers seek meanings, perceptions, and subjective interpretations. Similarly, ethnography studies cultures and communities through prolonged immersion and observation, where hypotheses are often unnecessary because

inquiry evolves dynamically within field contexts. These methods rely on the researcher's ability to be present and open to the data, rather than on predictive statements.

5.4 Abductive Reasoning and Pragmatism

Abduction involves moving iteratively between data and theory to develop plausible explanations. Unlike deduction, abduction embraces uncertainty, allows theoretical revision, and values emerging interpretations. Pragmatism prioritizes practical problem-solving over methodological rigidity; researchers select methods according to the research problem rather than a philosophical allegiance to hypothesis testing. Levers (2013) suggests that abductive reasoning is particularly suited to social science research, where the goal is often to find the most plausible explanation for a complex social phenomenon.

5.5 Data-Driven and AI-Assisted Research

Machine learning and artificial intelligence increasingly identify patterns without prior hypotheses. Techniques such as cluster analysis, predictive modeling, neural networks, and unsupervised learning generate knowledge inductively from large datasets (Jun *et al.*, 2021). These methods represent a fundamental shift away from hypothesis-driven research toward discovery-driven research, where the data itself suggests the direction of inquiry.

5.6 Case Study Research

Case studies investigate complex phenomena holistically rather than through narrow hypothesis testing. Flyvbjerg (2011) argues that case studies contribute substantially to scientific development even without formal hypotheses, particularly in generating context-dependent knowledge that can be used for theoretical generalization. The strength of the case study lies in its depth and detail, not in its ability to test a specific variable relationship.

6. Proposed Alternative Framework for Contemporary Research

A modern hypothesis-free research framework prioritizes discovery over confirmation. The table below contrasts the traditional model with emerging alternatives:

Traditional Model	**Emerging Alternative**
Hypothesis	Research question
Deduction	Induction/abduction
Variable testing	Meaning exploration
Statistical significance	Contextual interpretation
Linear procedure	Emergent design
Prediction	Discovery
Confirmation	Understanding
Fixed methodology	Flexible methodology

This framework better accommodates interdisciplinary inquiry, qualitative research, complexity science, digital research, and participatory methodologies. It acknowledges that different research questions require different methodological tools, and that the hypothesis is just one tool among many.

7. Implications for Educational Research

Educational research particularly benefits from moving beyond hypotheses because learning environments are socially constructed, culturally embedded, and context dependent. In fields such as Competency-Based Curriculum (CBC), Competency-Based Education (CBE), and Competency-Based Education and Training (CBET), researchers increasingly investigate experiences, implementation processes, teacher perceptions, learner engagement, and policy dynamics. These domains often require exploratory and interpretive approaches rather than rigid hypothesis testing. By embracing hypothesis-free methodologies, educational researchers can gain a deeper understanding of the complex interactions that define teaching and learning.

8. Conclusion

The hypothesis played a historically important role in the development of scientific inquiry under positivist traditions. However, contemporary research paradigms increasingly demonstrate that hypotheses are not universally necessary and, in many cases, may hinder genuine discovery. Modern scholarship recognizes that knowledge is contextual, reality is complex, inquiry is emergent, and understanding often precedes explanation. Grounded theory, phenomenology, ethnography, pragmatism, abductive reasoning, complexity theory, and data-driven research collectively reveal that rigorous inquiry can occur without formal hypotheses. Therefore, hypotheses should no longer be treated as compulsory components of research methodology. Instead, researchers should select methodological approaches appropriate to the nature of the inquiry, allowing flexibility, emergence, interpretation, and discovery to guide contemporary scholarship.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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