

Exploring Jacques Derrida's Deconstruction Theory and Its Implications for Mathematics Education

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Abstract: *Jacques Derrida's deconstruction theory, introduced in 1967, challenges the belief in fixed meanings in language, ideas, and texts. Rather than denying meaning, it encourages readers to explore multiple interpretations and question established assumptions. This paper examines how Derrida's constructs, such as difference, binary oppositions, textuality, and spatiality, apply to mathematics education. By doing so, it aims to reveal new pathways for enhancing learning outcomes by encouraging critical thinking and flexible interpretation in mathematical problem-solving.*

Keywords: deconstruction, binary oppositions, textuality, spatiality, mathematics education

1. Introduction

Jacques Derrida developed the deconstruction theory in 1967. It questions the notion that words, ideas, and texts have fixed meanings. Rather than dismissing meanings, the theory aims to reveal different interpretations and examine the assumptions behind accepted facts. Some facts that everyone agrees on are that meanings are not always clear, that language can be interpreted in different ways, that binary oppositions like speech/writing and nature/culture are not always true, that hierarchies are made instead of being natural, and that texts do not have fixed meanings, so they can be interpreted in different ways (Lamichhane, 2024; Sikirivwa, 2015). Derrida suggests that interpreting texts involves a complex interplay of signs whose meanings continually shift (Lamichhane, 2024, p. 35). Further, Lamichhane (2024) observes that one pivotal concept in deconstruction is "iterability," which refers to the idea that the repetition of signs generates new meanings. This challenges the belief that meanings remain constant over time (p. 35). Derrida's assertion that cognition and language are defined by "an exchange of disparities rather than by fixed essences" further underscores the fluidity of meaning and the inadequacy of traditional interpretations (p. 36). The perspective of the fluidity of meaning invites readers to reconsider how they engage with texts, recognizing that meanings are not static but are instead subject to change and reinterpretation.

According to Teske (2015), Derrida's critique extends to the metaphysical and ideological foundations of texts, as deconstruction seeks to uncover and subvert these underlying structures. He emphasizes that "deconstruction is concerned with the rigorous analysis of a text's metaphysical and ideological underpinnings" (p. 2). This analytical approach reveals the complexities and contradictions inherent in texts, allowing for a deeper understanding of their implications and the contexts in which they exist. Batarce (2021) posits that the concept of "différance" is a neologism combining "difference" and "deferment," central to deconstruction; it suggests that meaning in language is not fixed but arises from the differences between signs and is continuously deferred. The notion highlights the limitations of language, where "there is always something missing or absent" (p. 12).

Derrida's study of the "trace" (the idea that meaning is not fixed or present in a sign itself but is shaped by the differences and deferrals between signs) shows this absence even more, suggesting that each sign carries the remnants of what it means, making it harder to find a clear meaning (p. 12).

Barnett (1999) posits that deconstruction emphasizes the instability and ambiguity of language, asserting that "any meaning or concept is always subject to revision, reinterpretation, and re-contextualization" (p. 6). This perspective is not merely a negation of meaning or a rejection of social norms; rather, it represents an "affirmation of possibility within the limitations of contingency" (p. 6). By acknowledging the fluidity of meaning, deconstruction opens new avenues for interpretation and understanding, allowing for a richer engagement with texts. Teske (2015) observes that Derrida's work also critiques the traditional privileging of a "transcendental signified," a stable concept that serves as the ultimate ground of meaning (p. 17). He argues that this reliance on fixed meanings limits our understanding and appreciation of the complexities of language and thought. Instead, deconstruction invites us to embrace the multiplicity of meanings and the potential for new interpretations that arise from the interplay of signs, emphasizing the instability and fluidity of meaning. Derrida argues that context, culture, and history influence the dynamic interplay between the signifier (form) and the signified (concept), rather than a fixed relationship.

According to Lamichhane (2024), the implications of deconstruction have significantly influenced various fields, including mathematics (p. 35). By challenging established norms and encouraging a critical examination of texts, deconstruction fosters a deeper awareness of how language shapes our understanding of the world. This study aims to reveal different interpretations and examine the assumptions behind accepted facts and how they are applicable in mathematics education. Derrida's four constructs, difference, binary oppositions, textuality, and spatiality will serve as the foundation for this exploration. The purpose of this review is to critically examine the application of Derrida's deconstruction theory to mathematics education, with the goal of exploring how his constructs can enhance learners' understanding and performance. This study is significant as it

bridges philosophical theory and educational practice, offering fresh insights into how deconstruction can foster deeper engagement and critical thinking in mathematics education.

2. Methodology

To explore the application of deconstruction theory in mathematics education, I conducted a systematic literature search using Scopus and Google Scholar. Scopus was chosen as the primary database for its user-friendly interface, comprehensive indexing of peer-reviewed journals, and advanced filtering features that support rigorous academic research. Google Scholar complemented the search by offering access to a broader range of grey literature and additional relevant sources not covered by Scopus.

Search Strategy and Keywords

The search was guided by specific keywords and Boolean operators to capture a wide range of relevant literature. The primary search terms included: "deconstruction theory," "Derridean theory," "deconstruction theory in mathematics," and "deconstruction framework in mathematics education." These terms were selected to reflect both the philosophical origins of deconstruction (associated with Jacques Derrida) and its emerging application in mathematics education. The search was not restricted by publication date, allowing for the inclusion of both historical and contemporary perspectives.

Inclusion and Exclusion Criteria

The initial search returned 586 articles. To ensure relevance and focus, the following selection criteria were applied: only articles published in English were included; the content had to explicitly address mathematics education or the application of deconstruction theory to mathematical concepts; and the articles were required to engage directly with Derrida's ideas, including themes such as Marxism, logocentrism, binary oppositions, or critiques of foundational mathematical structures. Based on these criteria, the final selection was narrowed to 15 key articles, which serve as the core sources for the literature review.

Analytical Approach

The selected articles were analyzed qualitatively, focusing on how Derridean concepts are interpreted and applied in mathematics education literature. Special attention was given to conceptual frameworks involving deconstruction, critiques of deconstruction theory within educational contexts, and implications for teaching practices, curriculum design, and students' understanding of mathematical knowledge. Additionally, a few supplementary articles from the broader initial pool were consulted to triangulate findings and enrich the discussion with diverse scholarly perspectives.

3. Theoretical Review

This review explored Derrida's constructs of deconstruction theory, including *différance*, binary opposition, textuality, and spatiality, drawing on various sources to highlight Derrida's contributions to contemporary critical theory.

Difference

Jacques Derrida's concept of "différance" plays a pivotal role in his deconstruction theory, which critiques traditional notions of language and meaning. According to Barnett (1999, p. 280), "différance enacts a dual inversion: from presence to absence and from past to future, always deferring and destabilizing the origin." In this case, "difference" refers to the way that language creates meaning through two connected processes: difference (words and signs derive their meaning from their differences from other words and signs that signify them) and deferral (meaning is always and infinitely put off, never fully present). This underscores the perpetual delay of meaning, implying its never-full presence and constant susceptibility to reinterpretation. Lamichhane (2024) posits that Derrida's approach challenges the "traditional thinking of binary oppositions and the fixed meaning of the text" (p. 35), emphasizing the instability of language. He introduces the idea of "iterability," where "the repetition of signs creates new meanings and challenges that the notion of meaning remains always the same" (p. 35). This reinforces the notion that meanings evolve through context and repetition, undermining fixed interpretations. Lamichhane (2024) further notes that Derrida's critique of metaphysical assumptions about identity and meaning states that "Derrida... has also been associated with Jacques Lacan's challenge to the notion that a stable self exists beyond language or culture" (p. 37). This underscores his conviction that language and cultural contexts shape identities, rendering them fluid rather than fixed.

When it comes to figuring out what a text means, Barnett (1999) says that "deconstruction challenges orthodoxies of textual interpretation that might involve anchoring meaning in an authoritative, contextually determined center" (p. 278). This perspective encourages readers to engage with texts as dynamic entities, open to multiple interpretations. Christopoulos et al. (2020) observe that Derrida's ideas extend beyond literature; they also apply to fields like mathematics, where he suggests that "Derrida's philosophy offers opportunities to challenge the assumptions" (p. 3). For instance, we can relate the concept of *différance* to the development of number systems in the topics of number systems and infinity. We can see the transition from natural numbers to integers, then to rational and real numbers, as a continuous process of deferral and differentiation. Each expansion of the number system addresses the limitations of the previous one, yet always leaves room for further expansion (e.g., complex numbers, quaternions). This continuous process reflects the concept of perpetually deferring meaning in *différance* (Barnett, 1999; Batarce, 2021; Korkmaz, 2021).

Binary opposition

Lamichhane (2024) posits that "binary oppositions are conceptual pairs that are conventionally seen as opposites, with one term in the pair being preferred over the other... such as good/bad/evil, male/female, and nature/culture" (p. 35). Derrida uses the concept of hierarchy to describe the unequal relationship between the two terms in each opposition. In this context, hierarchy signifies that one term in the binary holds a privileged position over the other, showing greater cultural value or significance. The dominant term controls or governs the other term in the opposition, and there is a "violent

hierarchy" rather than a peaceful coexistence between the two terms. For instance, Western thought prioritizes "presence" over "absence" and, similarly, "speech" over "writing." Derrida highlights how binary oppositions operate and questions their stability to create a critical mind in the reader concerning conceptual frameworks that shape our understanding of the world. This approach exposes the inherent instability of language, where meaning is constantly in flux (p. 35). Derrida introduces the idea of "iterability," which suggests that the repetition of signs generates new meanings, thereby contesting the belief that meaning remains constant (p. 35). He argues that cognition and language are defined by "an exchange of disparities rather than by fixed essences" (p. 36). His concept of "différance" encapsulates this perspective, suggesting that an "endless chain of signifiers" perpetually postpones meaning (Teske, 2015).

Barnett (1999) notes that deconstruction challenges the orthodoxies of textual interpretation that seek to anchor meaning in a definitive, contextually determined center (p. 278). Consequently, Batarce's (2021) analysis reveals that texts are not self-contained; they are "complex, multi-layered" entities that rely on other texts for their meanings (p. 12). The notion of "trace," which views a text as a network of references that are "never fully present to itself," emphasizes this interconnectedness (Teske, 2015, p. 18). Deconstruction highlights that any meaning or concept is "always subject to revision, reinterpretation, and re-contextualization" (Barnett, 1999, p. 6). In mathematics education, the relationship between integers and real numbers shows the binary opposition of discrete/continuous. Integers represent discrete, countable values, while real numbers form a continuous spectrum. This opposition highlights the tension between discrete and continuous mathematics, which has implications for various fields such as calculus and computer science (Christopoulos et al., 2020; Korkmaz, 2021; Sediq, 2024).

Textuality

Derrida asserts that "textuality closely relates to context" (Lamichhane, 2024, p. 36). This is the idea that a text is not a fixed entity but is characterized by its decidability and fluidity. It involved the text's ability to mean and be in multiple ways, constantly differing from itself and deferring meaning. The concept challenges traditional notions of fixed meanings and interpretations, suggesting that texts exist within a network of meanings that are never fully decided or complete. Derrida's idea that "there is nothing outside the text" emphasizes that meaning is always contextual and contingent, without definitive or absolute interpretation (Barnett, 1999). This means that while contexts should always remain open to serve as contexts, they cannot ultimately contain the force of iterability (p. 288). The context in which one reads or interprets the text implies a constant shift in its meaning, rendering it fluid. Additionally, Teske (2015) notes that "deconstruction as a mode of textual criticism is thus applicable to all texts, regardless of their genre or historical context" (p. 18). This view aligns with Lamichhane (2024), who asserts that "deconstruction has challenged the traditional thinking of binary oppositions and the fixed meaning of the text" (p. 35). This points out the dynamic, contextual nature of textuality, where meaning emerges through the interplay between text, context, and interpretation. This perspective highlights the inherent

instability of language, emphasizing the constant deferral of meaning (p. 35). Central to this idea is the concept of iterability, which suggests that "the repeated signs create new meanings" (p. 35), indicating that meanings are not static but evolve with context and usage.

Derrida further complicates textuality with his notion of 'différance,' asserting that meaning is never fully present but always deferred or postponed (Teske, 2015, p. 18). This contradicts the traditional belief that a definitive, authoritative context can anchor meanings. Instead, Lamichhane (2024) argues that cognition and language are defined by "an exchange of disparities rather than by fixed essences" (p. 36). This suggests that we should not perceive cognition or language as static or unchanging entities. Instead, they are characterized by flexibility and adaptability. This is consistent with Barnett's (1999) assertion that a text can undergo "revision, reinterpretation, and recontextualization" (p. 6). However, he cautions against "textual aporia," a common feature of deconstructionist readings where a text appears to contradict itself or present an insoluble problem (p. 289). Moreover, Derrida emphasizes the interconnectedness of texts, asserting that they are "not self-contained or self-sufficient" (Ahi & Taheri, 2019; Batarce, 2021, p. 12) but rather exist within a "network of traces" (Teske, 2015, p. 18). This interconnectedness highlights that texts rely on other texts for their meanings, creating a complex web of interpretation. Deconstruction, therefore, is not merely a method of analysis but a rigorous examination of a text's "metaphysical and ideological underpinnings" (Teske, 2015, p. 2). For instance, the evolution and development of mathematical notation over time exemplifies textuality in action. We introduce new symbols and notations to express concepts more precisely, but these new forms always bear traces of earlier notations. For example, the evolution of calculus notation from Newton to Leibniz to modern forms demonstrates this ongoing process of textual refinement and reinterpretation. Newton's notation \dot{x} represented the derivative of x with respect to time. Later, Leibniz introduced the symbols dx and dy for infinitesimal increments and the elongated S (\int) for integration. He used d/dx for differentiation (Greaney, 2023).

Spatialization

Barnett (1999) posits that "deconstruction challenges the normative assumptions driving concepts of context and explores an alternative spatialization of these ideas through the themes of writing and iterability" (p. 277). The line between contexts and texts is not as clear as assumed, and ideas and texts can change throughout time. According to Barnett (1999), spatialization, as articulated through Derrida's deconstruction theory, refers to the practice of a text continuously redefining itself, making it fundamentally indecidable and different from itself. It challenges traditional notions by highlighting that texts are not self-contained but engage in a dynamic interplay with other texts and meanings. Hymen, for instance, can signify neither consummation nor virginity nor the veil nor the unveiling. Similarly, the word supplement can mean neither accident nor essence, neither an outside nor the complement of an inside. Derrida's idea of logocentrism, which favors speech over writing and reinforces a foundationalist view of meaning, exacerbates this instability (p. 280).

The concept of iterability illustrates how context perpetually reshapes meaning, leading to what Derrida describes as a "contextual fallacy" (Barnett, 1999, p. 283). Derrida questions the ideas that underlie metaphysics. He says that language and thought are defined by "an exchange of disparities rather than by fixed essences" (Lamichhane, 2024, p. 36). According to Barnett (1999), Derrida extends the critique to the hierarchical nature of binary oppositions, which prioritize one term over another, reinforcing traditional structures of thought (p. 280). In addition, Derrida's notion of "trace" highlights the absence inherent in language, suggesting that the relationship between signifier and signified is perpetually unfixed (p. 282). Further, his concept of Logocentrism, which favors speech over writing and reinforces a foundationalist view of meaning, exacerbates this instability (p. 280).

Barnett (1999) posits that "contexts must always be open to serve as contexts, but therefore they cannot finally contain the force of iterability: 'This is my starting point: no meaning can be determined out of context, but no context permits saturation.'" (p. 288). Derrida's deconstruction invites a reordering of values ascribed to marginal and secondary elements, suggesting a more nuanced approach to context. The implications of these ideas extend into education, where they foster a greater awareness of the complexities surrounding meaning and interpretation (Farahani, 2014, p. 2496). The concept of spatiality in mathematics education emphasizes that the arrangement of expressions influences their interpretation. For example, the expression: $3+4\times 5$ and $3+4\times 5$. The lack of spacing can make it more challenging to distinguish between operations quickly in Case 1. Some readers might interpret this as a simple left-to-right calculation. This could lead to incorrect application of the order of operations (PEMDAS/BODMAS). Incorrect solution process: $3+4=7$, then $7\times 5=35$ Correct solution process: $4\times 5=20$, then $3+20=23$ (Sediq, 2024).

Reflection

Reflecting on Derrida's deconstruction theory, attention is directed towards Sikirivwa's (2015) argument, which presents a contrary viewpoint; he asserts that "there are challenges in defining the theory of deconstruction because Derrida himself, who is its originator, has never given an authoritative definition of it" (p. 45). Critics argue that Derrida's theory is flawed due to its reliance on semiotic theory of linguistic meaning, which views the sign as a fundamental unit of meaning rather than the sentence itself. Further on page 49, Sikirivwa (2015) asserts, "The facticity of its differential relation with others always limits Deconstruction." This implies that the theory lacks practicality, as Derrida's interrogation process focuses on the structure of meaning itself, rather than serving as a method to test hypotheses or bolster arguments. Similarly, the construct (a) difference, where Derrida's neologism combines "difference" and "deferral," is criticized for obscurity and logical inconsistency (Lamichhane, 2024); (b) textuality, which extends the concept of "text" beyond written works, faces criticism for overextension, trivializing the specificity of different forms of communication and expression (Teske, 2015); (c) binary oppositions, is criticized for oversimplification since not all conceptual distinctions can be reduced to binary oppositions and self-contradictory since the very act of critiquing binary

oppositions often relies on creating new oppositions (Batarce, 2021); and (d) spatialization in writing and meaning is challenged because it may overemphasize visual and spatial aspects of language at the expense of other dimensions and also it can lead to a neglect of temporal aspects of meaning and interpretation (Sikirivwa, 2015).

According to Barnett's (1999) argument, "Deconstruction, then, is not simply a negation of meaning or an anarchic refusal of social norms, but rather an affirmation of possibility within the limitations of contingency" (p. 6). This suggests a potential for nihilism since deconstruction's emphasis on the instability of meaning can lead to nihilism or extreme relativism, undermining the possibility of objective truth or ethical standards.

4. Discussion

Jacques Derrida's deconstruction theory could challenge established norms in mathematics, such as the expectation that students provide explanations and justifications for their mathematical thinking and problem-solving approaches by utilizing concepts such as difference, binary oppositions, textuality, and space.

First, Barnett (1999) asserts that "difference enacts a dual inversion: from presence to absence and from past to future, consistently deferring and destabilizing the origin" (p. 280). This concept demonstrates the constant deferral of meaning and its contextual changes. Words and ideas do not have set meanings; they get their meaning from their relationships with other words. In mathematics education, this theory could challenge the idea that mathematical objects like numbers and equations have one clear meaning. This means that in mathematics, numbers and equations become dependent on context and the network of relationships between concepts rather than having an inherent singular definition. Barnett's (1999) argument suggests that each mathematical object carries traces of other concepts and what it is not, implying that its meaning is partially defined by its relationships and differences from other mathematical ideas. Similarly, Batarce (2021) notes that Différance could question the privileging of certain mathematical representations or approaches over others, encouraging a more inclusive view of mathematical knowledge. Furthermore, Giurea et al. (2014) contend that we always defer the "true" or "complete" meaning of mathematical objects, implying that our understanding of mathematics is constantly evolving and susceptible to reinterpretation. This approach opens the possibility for multiple valid interpretations of mathematical concepts, challenging the notion of a single, authoritative meaning. This perspective can lead to new understandings of learning, teaching, and social justice in mathematics education (Barnett, 1999; Korkmaz, 2021).

Teske (2015) asserts, "Derrida challenges this hierarchical order by insisting that the language that embodies them constructs and depends on these binary oppositions" (p. 17). People often present these common ideas in pairs, favoring one side over the other, such as good/bad or true/false. Derrida believes these pairs are unstable, and their meaning depends on each other. In mathematics education, we have multiple approaches to solving math problems that frequently

exist instead of a single "correct" solution. This approach can encourage creativity in students as they explore various problem-solving methods. Research in mathematics education has used binary oppositions as a theoretical construct in studying different aspects of teaching and learning. For instance, Korkmaz (2021) observes that the approach often underscores contrasting pairs, such as "theoretical" vs. "practical" knowledge and "math people" vs. "non-math people," especially regarding mathematics identity and ability. Greaney (2023) notes that binary oppositions in mathematics education highlight marginalized voices and experiences, advocating for more equitable mathematics practices. However, over-relying on binary oppositions may overlook the intersectional nature of identities and experiences, which are more complex than a simple dichotomy can capture. This insight prompts a reassessment of the perception of mathematical truths (Berger, 2010).

Barnett (1999) posits, "Deconstruction challenges orthodoxies of textual interpretation that might entail anchoring meaning in an authoritative, contextually determined center" (p. 278). Derrida posits that we can perceive everything, including language, systems, and knowledge, as a text open to multiple interpretations. He further observes that textuality analyzes the presentation of mathematical concepts in textbooks, classroom materials, and academic papers. Similarly, he observes that textuality has been applied to study the language (including symbols, diagrams, and verbal explanations, as interconnected texts that contribute to meaning-making) used in mathematics classrooms, revealing how mathematical ideas are communicated and negotiated between teachers and students. In line with these ideas, Sikirivwa (2015) observes that while the application of textuality in mathematics education research has provided valuable insights into the nature of mathematical communication and meaning-making, it also presents challenges in terms of practical application and acceptance within the field. For instance, focusing heavily on textuality might lead to neglecting other important aspects of mathematics education, such as problem-solving skills or cognitive processes (Christopoulos et al., 2020).

Derrida's work also prompts a reconsideration of the spatial dimensions of mathematical practices. Historical contexts and power dynamics shape mathematics as a social and cultural practice. "Through a Derridean lens, we can understand mathematics as a social and cultural practice, with its complex histories, power dynamics, and discursive formations," Christopoulos et al., 2020, observe (p. 3). This perspective highlights the importance of context in understanding mathematical concepts and practices. Deconstruction also questions the authority of textbooks and teachers as the only sources of mathematical truth. It encourages students to actively create knowledge instead of just accepting established norms. For instance, a study on Nepali mathematics educators highlighted the importance of critical conscience in knowledge construction, revealing themes related to culture, collaboration, and equity (Acharya et al., 2022, pp. 1030, 1038). Ultimately, the structure and style of research play a crucial role in its credibility, as emphasized by Derrida's work (Batarce, 2021, pp. 7-8). This reflection highlights the need for a nuanced approach to mathematics

education that embraces complexity and fosters critical engagement.

Regarding philosophical underpinnings, (a) epistemology challenges the existence of stable, universal knowledge that is always relational and continually delayed, never entirely present or established. This type of knowledge is context-dependent and open to many interpretations. (b) Ontology asserts that being is present. Reality is textual, so our understanding of the world is always mediated by language and interpretation, and (c) Axiology recognizes and respects alterity or otherness, questioning using systems of thought.

5. Conclusion

Derrida's work is key to educators and researchers in mathematics education in the way they understand language, meaning, and interpretation. First, the instability of language reveals that meanings are not fixed; they are fluid and can shift depending on the context, as Derrida asserts that "meaning is always deferred" (Lamichhane, 2024, p. 35). This insight encourages educators and researchers to remain open to multiple interpretations rather than seeking a singular truth. Second, Derrida's critique of binary oppositions challenges traditional dichotomies, urging educators and researchers to question oversimplified classifications that obscure complexity. This lesson fosters a more nuanced approach to understanding ideas and texts. The concept of iterability highlights that the repetition of signs can generate new meanings, suggesting that our interpretations evolve. Derrida instills a sense of skepticism toward definitive interpretations. He posits that achieving a certain understanding of a text is impossible, prompting educators to adopt a critical mindset when engaging with literature and ideas. This perspective encourages recognition of the variability in interpretations. Last, the ethical implications of deconstruction suggest that it is not merely a rejection of meaning, but an affirmation of possibilities within contingency constraints. These insights not only reshape personal perspectives but also offer valuable guidance for educators and researchers seeking to incorporate critical theory into mathematics education.

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