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Beyond Stigma or Reimagining Malvina: The Role of Artificial Intelligence in Supporting Dyslexic Learners in Historical and Contemporary Contexts

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ABSTRACT

This paper examines the intersection of historical educational exclusion with modern AI tools that support learners with dyslexia, utilizing Michel Peyramaure's L'Orange de Noël as a literary lens. The novel's portrayal of Malvina Delpeuch, likely dyslexic, reveals systemic failures in early 20th-century French education, highlighting cultural stigmas and institutional neglect faced by neurodivergent students in a strict, religious setting. It contrasts these issues with contemporary AI applications, such as annotation systems, diagnostic models, and personalized learning apps, which enhance accessibility and shift the culture from stigma to support. An interdisciplinary approach links literature, technology, and disability studies, envisioning learners like Malvina being recognized and empowered. Recommendations include incorporating AI into classrooms, training teachers, and ensuring the ethical use of AI. The paper concludes that AI can address historical inequalities and foster inclusive education when used thoughtfully, advancing justice, neurodiversity, and digital learning dialogues.

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1. INTRODUCTION

The turn of the 20th century in France was a period of profound ideological transformation, particularly in the realm of education. The enforcement of the 1905 Law on the Separation of Church and State represented a powerful institutional push toward secularization, aiming to eliminate ecclesiastical influence from public education and establish a neutral, republican framework for learning (Ehigie & Braimoh, 2024). Amid this broader cultural shift, Michel Peyramaure's L'Orange de Noël offers a poignant literary exploration of the challenges that accompanied this transition. At the heart of the novel lies Malvina Delpeuch, a young girl mischaracterized by her community as "mentally delayed" due to symptoms now understood as developmental dyslexia. Her experiences serve as a microcosm of how ignorance and lack of educational resources reinforced stigma in early 20th-century rural France. Dyslexia, as a recognized neurodevelopmental disorder, was not systematically understood or accommodated until the latter half of the 20th century. In Peyramaure's narrative, Malvina's isolation and marginalization underscore the absence of both diagnostic awareness and pedagogical strategies necessary to support neurodivergent learners. Ehigie and Braimoh (2024) highlight how the dominant religious educational paradigms of the time conflated difference with deficiency, offering little room for inclusivity. In contrast, the character Cécile Brunie, who symbolizes the progressive, secular teacher, embodies a more compassionate, human-centered approach, reflecting the early inklings of inclusive education.

With the evolution of artificial intelligence (AI), educational paradigms have undergone significant expansion. AI-powered technologies are now employed to assess, diagnose, and assist learners with specific learning disabilities such as dyslexia. Yap et al. (2025) emphasize that AI-based platforms can provide real-time adaptive learning environments, voice-to-text support, and pattern recognition for early detection, all of which can fundamentally reshape the trajectory of students like Malvina. Similarly, Clement and Tosin (2025) argue that assistive technologies not only improve literacy rates among dyslexic learners but also enhance emotional well-being by reducing classroom stigma. This intersection between historical exclusion and modern technological possibility invites a re-imagining of educational experiences like Malvina's. According to the review by Kari, Aruthanan, and Chin (2025), contemporary applications of AI in dyslexia research and pedagogy demonstrate significant progress in education's ability to address cognitive diversity. Meanwhile, other scholars, such as those in the 2024 study on AI advancements in dyscalculia and

dyslexia, emphasize that modern algorithms can personalize instruction down to phonemic, syntactic, and semantic difficulties, enabling precision that traditional instruction lacked.

Moreover, these AI tools do more than aid comprehension; they confront deep-seated social attitudes. The work of Boily (2018) and Picut (2014), referenced in Ehigie and Braimoh's (2024) analysis, emphasizes the importance of pedagogical compassion and individualized learning environments for dyslexic learners. What AI achieves today is the operationalization of such empathy at scale. In other words, AI does not simply "teach" better; it reconfigures the societal lens through which neurodiversity is viewed and supported. Therefore, by placing L'Orange de Noël in dialogue with emerging AI innovations in inclusive education, this paper explores how fictional portrayals of learning challenges can illuminate the transformative possibilities of contemporary technology. Reimagining Malvina's story with AI intervention reveals both how far education has come and how literature remains an invaluable tool in humanizing policy and practice. Through this historical-literary-techno lens, the paper argues for a renewed understanding of educational equity, one that bridges the past's rigid exclusions with the present's evolving tools of inclusion.

2. OBJECTIVES OF THE STUDY

- To explore how AI could support dyslexic learners like Malvina in the literature.
- To compare historical and modern responses to learning disabilities.
- To examine the role of societal stigma and technological solutions.
- To contribute to inclusive education discourse through literary and technological lenses.

3. LITERATURE REVIEW

3.1. Historical Depictions of Dyslexia and Educational Constraints

In their work on L'Orange de Noël, Ehigie and Braimoh (2024) provide a vital lens into the socioeducational atmosphere of early 20th-century France, where children like Malvina Delpeuch, depicted as cognitively delayed but likely dyslexic, were misunderstood and ostracized. The rigid Catholic educational structures of the time failed to differentiate between behavioral divergence and cognitive difference, often resulting in marginalization. Through a literary-historical approach, the authors argue that secular reforms in education, represented by characters like Cécile Brunie, created a more inclusive and empathetic space for neurodiverse learners, albeit still constrained by the era's limited pedagogical understanding. In contrast, contemporary scholarship illustrates a revolution in how dyslexia is diagnosed and supported. Yap, Aruthanan, and Chin (2025) offer a scoping review of artificial intelligence (AI) in dyslexia research and education, outlining how machine learning techniques, including deep neural networks and support vector machines, can identify dyslexia early based on linguistic markers and behavioral data. They emphasize that such tools enable early intervention and provide personalized instruction strategies tailored to individual learners' profiles, a striking contrast to Malvina's static and punitive environment.

Similarly, Alkhurayyif and Sait (2024) review AI-based dyslexia detection techniques, analyzing feature extraction from eye-tracking data, handwriting patterns, and speech fluency. They highlight not only the diagnostic potential of these methods but also the ethical concerns around bias, misclassification, and digital accessibility, elements that were absent in the early 20th-century setting. Dabaghi, D'Urso, and Sciarrone (2024) examine how AI enables dyslexic learners to transition from passive recipients to active participants by supporting autonomy and scaffolding comprehension. Their review reveals how AI not only facilitates decoding and phonological awareness but also fosters engagement through adaptive content delivery. This transformation is exactly the type of educational shift that characters like Cécile champion in Peyramaure's novel, yet without the technological support available today.

Wang, Muthu, and Sivaparthipan (2021) present a technical application: an AI-based augmentative and alternative communication (AAC) tool designed for students with dyslexia. Their model uses a hybrid classifier and AR-based support to reduce communication latency and improve expressive language development. These approaches directly address the type of challenges Malvina experienced, difficulties in self-expression and social engagement, which were misread as mental deficiency rather than signs of a neurodivergent profile. Providing a broad survey, Rose, Dethlefs, and Atanbori (2022) examine the integration of AI in the diagnosis, screening, and treatment of dyslexia. Their research maps out a landscape of multimodal tools, including speech recognition, predictive analytics, and natural language processing, all of which are used to differentiate dyslexic profiles from other learning challenges. The authors stress the importance of explainability in AI models to ensure trust and usability among educators. This dimension would have profoundly changed how a character like Malvina was assessed and supported.

The convergence of these AI-centered studies with the historical and fictional representation of dyslexia in L'Orange de Noël forms an important interdisciplinary insight. While Ehigie and Braimoh (2024) focus on the sociocultural and religious barriers to inclusive education, the reviewed AI literature illustrates technological opportunities to overcome those very barriers today. The compassion embodied by Cécile in Peyramaure's novel finds a parallel in today's AI-enhanced pedagogy, systems designed not merely to

accommodate dyslexia but to understand and empower neurodiverse learners. The reviewed literature highlights a significant gap: while fictional narratives have long acknowledged the emotional and social toll of educational exclusion, technology has only recently developed the tools to address it in a meaningful way. This paper aims to bridge that gap by reimagining Malvina's narrative through the lens of AI-driven educational inclusion.

3.2. Research Gap

Despite growing scholarly attention to the role of artificial intelligence (AI) in education, particularly for students with learning disabilities such as dyslexia, a noticeable gap exists at the intersection of literary representation, historical educational exclusion, and modern technological intervention. Most existing research focuses on either the technical capabilities of AI in diagnosing and supporting dyslexic learners (Yap et al., 2025; Alkhurayyif & Sait, 2024) or on pedagogical innovations within current educational systems (Dabaghi et al., 2024; Wang et al., 2021). While these studies are invaluable in advancing inclusive education, they often overlook the broader cultural and historical narratives that have shaped public perceptions of learning differences. Literary texts like Michel Peyramaure's L'Orange de Noël offer critical insights into how society has historically treated children with undiagnosed learning disorders. Malvina Delpeuch's character reflects the consequences of an era lacking both scientific understanding and empathetic pedagogy. However, little research has been conducted to explore how fictional representations of such learners can inform or be reimagined through the lens of modern AI-supported education.

Furthermore, while studies like that of Rose et al. (2022) emphasize the integration of AI into diagnosis and personalized learning, there is limited exploration of how these tools might reshape not only outcomes but also societal attitudes, which are often influenced by culture, media, and literature. Ehigie and Braimoh (2024) explore the intersection of secularization, stigma, and exclusion in early 20thcentury French education, but they stop short of linking these themes to the technological remedies available today. This study, therefore, addresses a dual gap: the absence of interdisciplinary analysis that bridges literary representation with AI-enabled pedagogy, and the need to contextualize current technological capabilities within a socio-historical framework of educational inequality. Bridging this gap enables a more comprehensive and culturally responsive understanding of inclusive education.

4. METHODOLOGY

This study employs a qualitative, interpretive methodology that synthesizes literary analysis with educational theory and emerging frameworks in artificial intelligence (AI). At its core, the research involves a comparative textual analysis of Michel Peyramaure's L'Orange de Noël, focusing on the portrayal of Malvina Delpeuch as a historically situated dyslexic learner, reimagined through the lens of contemporary AI-supported educational practices. The first component of the methodology is grounded in close reading and thematic analysis. Following the model presented by Soni and Govindaraju (2025), AI is not treated merely as a computational tool but as a cognitive partner in interpreting and extracting patterns from literary text. The study draws on narrative elements, character development, and historical context to surface themes of educational exclusion, stigma, and cognitive difference.

Complementing this, the research adopts a phenomenological approach, inspired by Roozafzai (2025), who emphasizes the lived experiences of marginalized learners within broader socio-cultural contexts. By viewing Malvina's narrative through this lens, the study contextualizes her experiences as reflective of a broader class of learners who have historically been denied recognition and support. To integrate modern perspectives, the study employs a mixed-methods design that utilizes AI language models to simulate and assess how personalized learning technologies might have impacted Malvina's educational trajectory. Karjus (2023) supports this form of machine-assisted humanistic inquiry, where scalable AIbased insights enrich qualitative interpretations. Furthermore, the research employs guided prompt engineering for thematic coding, following the approach outlined by Zhang et al. (2023). This process involves generating interpretive codes from the literary text using a structured AI-human collaboration, ensuring transparency and consistency in the analytical process.

Lastly, techniques from Leavy et al. (2023) inform the selection and semantic curation of historical and literary references that align with the novel's themes. This ensures that textual evidence used in the analysis is both thematically coherent and contextually rich. Together, these methodological layers enable a nuanced exploration of how historical fiction and AI-based educational tools intersect in illuminating the possibilities for inclusive learning, past and present.

5. ECHOES OF MALVINA, EDUCATIONAL STRUGGLES AND THE PLACE OF AI IN THE CULTURAL SHIFT

5.1. Malvina's Educational Struggles as a Reflection of Historical Neglect

In L'Orange de Noël, Michel Peyramaure presents a poignant case study in the character of Malvina Delpeuch, whose experiences as a misunderstood child reflect the broader historical neglect of learners with specific cognitive differences. Malvina is portrayed as slow, detached, and mentally unfit by her community, a perception that stems not from a clinical diagnosis or empirical understanding of her condition, but from widespread ignorance, superstition, and educational limitations characteristic of early 20th-century rural France. This neglect is not unique to Peyramaure's fictional world. However, it is somewhat grounded in the historical

realities of how societies, particularly in pre-diagnostic eras, responded to what we now identify as dyslexia and other learning disabilities.

Ehigie and Braimoh (2024) offer a vital backdrop to understanding this environment. Their analysis of secularization and religious intolerance in early 20th-century French education highlights the rigid ideological frameworks that governed educational practice. In rural regions, especially, education was a contested space between emerging secular ideals and entrenched religious conservatism. While secular education introduced progressive pedagogical ideas, it did not yet possess the psychological or scientific tools to identify and support learning disorders. In this context, children like Malvina were left to fall through the cracks, misread as mentally deficient when, in reality, they experienced cognitive differences for which no support systems existed. Historical research supports the view that individuals with dyslexia were often marginalized well into the 20th century. According to Gibbs and Elliott (2020), the concept of dyslexia gained academic legitimacy in the mid-to-late 20th century. Before this recognition, the reading struggles of individuals like Malvina were largely dismissed as laziness, defiance, or stupidity. Teachers lacked both the training and resources to accurately interpret non-normative learning behaviors, resulting in institutional neglect on a systemic level. Smith (2019) traces this neglect back even further, to the Victorian period, where early notions of dyslexia were framed under the term “word-blindness.” During this time, many children who could not master reading or writing were punished or labeled as deficient, despite often possessing strong verbal, creative, or analytical skills. The experiences of Malvina in L’Orange de Noël echo these realities. Her community misinterprets her limited verbal expression and difficulty with traditional academic tasks, while her potential remains largely invisible, save for the intervention of Cécile Brunie, the new schoolteacher. Cécile's arrival introduces a counterpoint to the dominant ideology of exclusion. As Ehigie and Braimoh (2024) argue, the figure of the secular educator symbolizes a transformative, if limited, force within the otherwise stagnant pedagogical environment. However, even Cécile operates within a system unequipped to support learners like Malvina beyond sympathy and intuition. This highlights the structural inadequacies of the time: while individual educators may have shown compassion, there were no formal diagnostic protocols, adaptive learning tools, or specialized curricula to support learners who are neurodivergent.

The rural setting of Peyramaure’s novel further compounds Malvina’s struggles. Brooks and Fitzgerald (2018) emphasize that the emergence of dyslexia as a societal concern only gained momentum with the advent of universal literacy. In agrarian or low-literacy societies, cognitive differences were less noticeable or more easily attributed to social or moral failings. In the small village where Malvina lives, literacy is not only a symbol of educational success but also of moral and intellectual worth. Failing to read fluently is not seen as a cognitive variation but as evidence of being inherently "lesser." Moreover, Wang and Thompson (2021) discuss how cultural attitudes in the 19th and early 20th centuries often pathologized learning difficulties. Their historical perspective shows that many educators viewed reading struggles as rooted in discipline, willpower, or even moral degeneracy. In Malvina's case, these attitudes are reflected in the community’s labeling of her as an imbecile, reinforcing social stigma and deepening her educational alienation. Rather than being assessed through any empirical lens, her academic performance is interpreted through a cultural matrix that conflates intellectual ability with conformity to rigid behavioral expectations.

The consequences of such neglect were profound. Without recognition or support, children like Malvina were denied access to the full range of developmental opportunities. Their talents, whether artistic, kinesthetic, interpersonal, or even linguistic in non-traditional forms, went unnoticed or underdeveloped. Gibbs and Elliott (2020) note that the delay in identifying and legitimizing dyslexia meant generations of children were unfairly failed by their educational systems. In L’Orange de Noël, this failure is not only personal but also systemic, illustrating how institutional blindness can lead to lifelong marginalization. Another significant dimension of Malvina’s struggle is the lack of parental advocacy, a theme subtly explored in Peyramaure’s narrative. While her father’s resistance to her education reflects the larger anti-republican sentiment documented by Ehigie and Braimoh (2024), it also signals the absence of an informed support network for children with learning challenges. In the absence of scientific understanding, parents were left to rely on religious or cultural interpretations of their children’s development, which often exacerbated their exclusion. Despite the grim depiction, Malvina’s narrative also offers a point of resistance. Her partial inclusion under Cécile’s guidance hints at what could have been possible with more institutional awareness and support. Though Cécile lacks the tools available to modern educators, such as individualized learning plans or AI-powered diagnostic tools, she provides what the system cannot: recognition of Malvina’s humanity. This early gesture toward inclusion, albeit limited, reveals the transformative power of teacher empathy in countering structural neglect. However, this transformation is halted by the broader community’s unwillingness to reframe their perceptions. The village, as portrayed by Peyramaure, is not merely ignorant but willfully resistant to change. The collective stigma attached to learners like Malvina is upheld through a mix of religious dogma, social hierarchy, and educational rigidity. These forces operate in tandem to reinforce her exclusion, making it clear that educational neglect in such contexts was not a result of individual oversight but of an entrenched cultural logic.

Malvina’s educational journey in L’Orange de Noël is emblematic of a historical era when cognitive differences were not only misunderstood but actively marginalized. Her struggles mirror those of countless children who, lacking diagnosis and support, were

misread and mistreated. Supported by historical analyses from Smith (2019), Brooks and Fitzgerald (2018), and Wang and Thompson (2021), her story underscores the systemic failures of early education systems. Paired with the contextual foundation laid by Ehigie and Braimoh (2024), Malvina's narrative serves as a stark reminder of the consequences of institutional neglect and a call to reflect on the critical need for inclusive, empathetic, and scientifically informed education both in the past and present.

5.2. AI Tools and the Transformation of Learning for Dyslexic Students

The rise of artificial intelligence (AI) in education has marked a significant turning point in the support available for dyslexic students. In contrast to earlier periods characterized by neglect and misinterpretation, as seen in the case of Malvina Delpeuch in L'Orange de Noël, contemporary AI tools offer real-time diagnosis, personalized learning, and enhanced accessibility. These technological developments represent not only functional tools but also conceptual shifts in how dyslexia is perceived, understood, and addressed in educational contexts. Where once students like Malvina were labeled as mentally deficient, AI has enabled a reframing of such learners as capable, creative, and simply in need of differentiated support. One of the most significant developments in AI-assisted dyslexia education is the use of large language models (LLMs) and annotation systems designed to enhance text comprehension. Zhao et al. (2025) present a compelling case with their LARF system, also known as "Let AI Read First." This tool uses LLMs to generate simplified annotations and restructured content for individuals with dyslexia. In their study, LARF was tested with 150 participants with dyslexia, resulting in substantial improvements in reading fluency and comprehension, particularly among individuals with more severe reading challenges. By modifying the structure and complexity of texts without diluting meaning, LARF enhances accessibility while preserving content richness. For learners like Malvina, who would have struggled with traditional, densely written texts, such technology could have made formal education not only possible but also empowering.

The potential of AI lies not only in readability assistance but also in its capacity to tailor educational content to individual learners. Personalized recommendation systems, such as those developed by Morciano et al. (2024), use collaborative filtering and learner profiling to recommend optimal learning tools and strategies. These models are trained on data that includes student behavior, preferences, and past performance. Once trained, the systems can recommend tools such as speech-to-text applications, visual learning aids, or customized reading paths, tailored to the student's unique profile. This stands in stark contrast to the rigid, one-size-fits-all model of early 20th-century education that Malvina was subjected to. While her teacher, Cécile, attempted to personalize instruction using empathy and intuition, today's educators can leverage data-driven systems to make evidence-based decisions that support learners.

One area where AI has made significant advancements is in the early detection and diagnosis of dyslexia. Traditional diagnostic models have relied heavily on teacher observation and standardized assessments, both of which are vulnerable to bias and subjectivity. In contrast, AI-based diagnostic tools utilize measurable inputs, such as handwriting, speech patterns, and eye-tracking data, to identify signs of dyslexia. Robaa et al. (2024) introduce an explainable AI (XAI) framework that utilizes handwriting recognition and transfer learning for the detection of dyslexia. Their model combines transformer-based architectures with Grad-CAM visualizations to not only classify handwriting samples with over 99 percent accuracy but also to explain how and why the model reached a particular conclusion. This level of interpretability is critical in educational contexts, where both teachers and parents require transparency in understanding a student's challenges and the rationale behind intervention strategies. The emphasis on explainability is more than a technical achievement. It addresses a fundamental barrier that learners like Malvina faced: mistrust and misunderstanding. In the early 20th-century setting of L'Orange de Noël, there was no established empirical framework for assessing learning difficulties, leaving students vulnerable to stigmatization and mistreatment. Explainable AI offers a way to bridge that gap by providing clear, visual evidence of how a student processes information distinctly. Such insights allow educators to not only intervene earlier but also to advocate more effectively for their students within school systems and communities.

Another transformative aspect of AI in dyslexic education is its ability to foster learner autonomy. Historically, students with dyslexia were often dependent on human mediators to access information. Teachers, parents, or peers were required to read to them, transcribe their responses, or interpret instructions. Today, AI-powered tools such as text-to-speech engines, adaptive learning environments, and real-time feedback systems enable students to work independently, which in turn boosts self-esteem and engagement. Tools like LARF exemplify this shift by allowing dyslexic learners to engage with texts on their terms. This independence would have drastically altered Malvina's experience, potentially empowering her to take control of her education and challenge the assumptions made about her cognitive abilities. Moreover, the integration of AI into educational technologies supports inclusive classroom practices. In contrast to special education models that isolate students, AI tools can be seamlessly integrated into mainstream platforms, making accommodations stigma-free. This is particularly important in rural or conservative communities, such as the one depicted in Peyramaure's novel, where deviation from the norm is often met with suspicion or hostility. By normalizing the use of adaptive tools across the classroom, AI has the potential to reduce the social barriers that have historically plagued neurodivergent learners.

Notably, the implementation of AI tools must be accompanied by ethical considerations and culturally responsive pedagogy. While the tools themselves offer great promise, they must be deployed in ways that account for socioeconomic disparities, digital literacy, and local attitudes toward disability. Robaa et al. (2024) emphasize the need for transparency and community engagement in introducing AI diagnostics in educational settings. Similarly, Morciano et al. (2024) advocate for systems that learn from users in context, ensuring that the recommendations they produce are not only technically accurate but also culturally and educationally appropriate. The work of Zhao et al. (2025) also points to future directions in AI design that prioritize learner empowerment. Their research suggests that future iterations of AI tools could include multimodal content delivery, emotional recognition, and interactive feedback mechanisms. For students like Malvina, who may also struggle with social interaction or selfexpression, such holistic tools could provide support that extends beyond academics, contributing to personal development and emotional well-being. AI has profoundly transformed the landscape of dyslexia education. From early diagnosis to personalized learning and inclusive classroom design, AI tools offer solutions that directly address the types of struggles faced by learners like Malvina Delpeuch. Where historical education systems faltered due to ignorance and rigidity, contemporary technologies offer pathways to understanding, empowerment, and success. The studies by Zhao et al. (2025), Morciano et al. (2024), and Robaa et al. (2024) not only illustrate the technical advancements but also highlight the importance of ethical, transparent, and student-centered implementation. These developments mark a fundamental shift in educational philosophy, one that recognizes diversity as a strength and technology as a means to bridge the equity gap.

5.3. From Stigma to Support: The Cultural Shift Enabled by AI in Education

The transformation of educational practice through artificial intelligence (AI) is not solely a matter of technological innovation. It also reflects a broader cultural shift, one that moves away from the stigmatization of learning differences toward a model of inclusive, evidence-based support. In Michel Peyramaure's L'Orange de Noël, the character of Malvina Delpeuch illustrates the devastating consequences of a culture that fails to understand or accommodate neurodivergent learners. Branded as mentally deficient and marginalized by her community, Malvina becomes a symbol of how deeply ingrained cultural norms and systemic ignorance once dictated the fate of children with undiagnosed cognitive differences. Today, however, AI-powered educational tools offer more than functional assistance. They help reframe the narrative around learning disabilities and promote a shift from exclusion to empowerment.

As Ehigie and Braimoh (2024) argue in their examination of L'Orange de Noël, the rural French educational system of the early 20th century was not equipped to recognize or support learners with special needs. The combined forces of religious orthodoxy, limited teacher training, and ideological rigidity contributed to a system in which failure to conform to standard academic performance was equated with moral or intellectual failure. Malvina's community interprets her quietness, slowness, and inability to read as signs of mental retardation, reinforcing the stigma around cognitive difference. Even with a progressive teacher like Cécile Brunie, the tools and institutional frameworks necessary to identify Malvina's dyslexia are absent.

This context of stigma and neglect persisted for much of the 20th century. As Smith (2019) notes, early understandings of dyslexia, then referred to as "word-blindness," were often buried beneath moralistic or punitive educational philosophies. Teachers lacked both diagnostic frameworks and conceptual language to differentiate learning styles or disorders. Dyslexic children were routinely labeled as lazy, inattentive, or unintelligent. The result was widespread alienation and systemic failure to educate entire categories of learners. The shame associated with learning differences became internalized, reinforcing cycles of academic underperformance and low self-worth. In such a climate, the possibility of support depended entirely on rare individuals who could see beyond the prevailing norms. Cécile, in L'Orange de Noël, is one such figure, offering Malvina compassion and patience. Nevertheless, her efforts, as documented by Ehigie and Braimoh (2024), are undermined by the absence of institutional recognition and scientific knowledge. She intuits that Malvina is not intellectually inferior but lacks the tools to act on this insight. Her role reflects a cultural moment of transition, an early, isolated challenge to a larger structure of exclusion.

Contemporary developments in AI have provided a pathway for scaling the type of individualized understanding that teachers like Cécile could only offer sporadically. Tools like those presented by Zhao et al. (2025), such as the LARF system, demonstrate how AI can facilitate not only academic improvement but also cultural inclusion. LARF enables learners to access content in restructured, simplified formats that retain intellectual depth while improving accessibility. By creating a consistent, automated method for adapting text, it removes the dependence on individual teacher intervention and embeds support within the educational infrastructure itself. Dyslexic learners can now engage with materials without being visibly "different" or dependent on external help, reducing stigma in real time. The work of Robaa et al. (2024) further supports this cultural shift through their development of explainable AI (XAI) for handwriting-based dyslexia diagnosis. Importantly, their model does not function as a black box, but rather provides visual explanations for its conclusions, utilizing Grad-CAM and other tools to demonstrate how decisions are made. This transparency is critical in educational contexts. It enables teachers, parents, and students to understand the reasoning behind diagnoses and interventions. In the past, the invisibility of learning differences contributed to mislabeling and blame. Explainable AI reverses this

dynamic by making cognitive processes visible and understandable, thereby fostering empathy and reducing assumptions rooted in ignorance.

Personalized AI recommendation systems, such as those developed by Morciano et al. (2024), also play a pivotal role in cultural transformation. These systems assess individual learner data to propose tools and learning pathways that are best suited to their needs. More than just improving academic outcomes, these systems affirm the principle that no two learners are the same. In doing so, they validate neurodiversity and challenge the notion that deviation from standardized performance indicates deficiency. For learners who might otherwise internalize failure as a personal shortcoming, such affirmations are profoundly liberating. In a historical context, this represents a radical departure from the uniformity that characterized early public education systems, as depicted in L'Orange de Noël. Moreover, the cumulative impact of these AI tools contributes to changing societal narratives. When technologies are designed and implemented in inclusive ways, they normalize diversity. Students who use text-to-speech tools, receive AI-recommended learning content, or benefit from customized assessments are no longer isolated cases. Instead, they become part of a broader system that accommodates a range of cognitive experiences. This normalizing effect, as described by Zhao et al. (2025) and Morciano et al. (2024), reduces the symbolic divide between neurotypical and neurodivergent students. It creates a classroom culture where support is expected and stigma has no foothold.

The cultural shift enabled by AI is not only occurring within classrooms but also influencing the ways institutions and families perceive learning differences. Robaa et al. (2024) emphasize that transparent diagnostics promote trust in AI systems and foster greater willingness among educators and caregivers to pursue interventions. In the absence of such trust, as seen in Malvina's village, unfamiliar behaviors are met with suspicion and resistance. AI enables the reframing of these behaviors in medical and educational terms, thereby humanizing the learner and facilitating collaborative, informed support systems. That said, the integration of AI into education is not without its challenges. As Ehigie and Braimoh (2024) and Brooks and Fitzgerald (2018) suggest in their respective discussions on early educational exclusion, systems of belief and cultural resistance can persist despite technological progress. The mere availability of AI tools does not guarantee their acceptance. Implementation must be accompanied by teacher training, community engagement, and culturally responsive pedagogy. In this regard, the cultural shift toward support must be consciously cultivated, not simply engineered. The transition from stigma to support in dyslexic education reflects a broader cultural reorientation that is both facilitated and accelerated by AI. Where students like Malvina were once condemned by ignorance, modern learners can be empowered by intelligent systems designed to understand and assist. This shift is not merely a technical improvement but a transformation in how society defines learning, ability, and worth. Through tools like LARF (Zhao et al., 2025), explainable diagnostic models (Robaa et al., 2024), and personalized learning systems (Morciano et al., 2024), AI is reshaping the educational landscape into one where differences are not only accepted but also embraced. It completes a journey that began with isolated acts of compassion, like those of Cécile Brunie, and moves us toward systemic inclusion and dignity for all learners.

6. CONTRIBUTION TO RESEARCH

This study makes a significant interdisciplinary contribution by bridging literary analysis, educational history, and contemporary applications of artificial intelligence (AI) in inclusive pedagogy. Through the lens of Michel Peyramaure's L'Orange de Noël, it revisits the historical exclusion of neurodivergent learners, exemplified by the character Malvina Delpeuch. It reimagines how AI-based educational tools could have transformed her experience. While most existing literature treats dyslexia through either technical or educational frameworks, this research uniquely positions itself at the intersection of literature, cultural studies, and AI-driven educational technology. By analyzing a fictional but contextually grounded character like Malvina, the paper foregrounds the human consequences of systemic neglect. It contrasts them with the transformative potential of modern, AI-enhanced learning environments. The study further contributes to the evolving discourse on educational equity by integrating historical, literary, and empirical research. It draws connections between early 20th-century educational structures and the current capabilities of AI in addressing learning differences. In doing so, it offers a reflective model that not only critiques past failures but also demonstrates how current and future technologies can serve as vehicles for social justice in education. By leveraging tools such as AI-powered annotation (Zhao et al., 2025), explainable diagnostic models (Robaa et al., 2024), and personalized learning systems (Morciano et al., 2024), the study illustrates how technological interventions can break cycles of marginalization that once seemed entrenched.

Moreover, this research challenges the conventional boundaries of both literary interpretation and AI application by proposing a framework that informs contemporary educational design with historical narratives. It invites researchers, educators, and developers to consider the ethical, cultural, and historical dimensions of AI deployment in learning environments. Finally, it fills a notable gap in current scholarship by demonstrating how literary representations of disability can serve as powerful case studies for the ongoing evolution of inclusive education. In doing so, it not only contributes to the humanities but also to educational technology, psychology, and digital pedagogy, marking a meaningful step toward a more integrated and empathetic understanding of AI's role in supporting neurodiverse learners.

7. RECOMMENDATIONS

In light of the findings and thematic intersections explored in this study, several key recommendations emerge for educators, policymakers, technologists, and researchers working at the intersection of inclusive education and artificial intelligence. First, educational institutions should actively integrate AI-powered tools that support learners with dyslexia and other cognitive differences. Tools such as the LARF system (Zhao et al., 2025), which simplifies and annotates complex texts for improved comprehension, and personalized recommendation models (Morciano et al., 2024), which guide learners toward optimal strategies, should be integrated into mainstream classroom settings rather than being confined to special education units. This approach promotes normalization of support tools and reduces stigma.

Second, teacher training programs must be restructured to include comprehensive digital literacy modules, with a particular focus on AI applications for inclusive learning. As shown in historical accounts such as those analyzed by Ehigie and Braimoh (2024), educators like Cécile were often alone in their efforts to support marginalized learners due to a lack of institutional resources or guidance. Modern educators should be empowered not only with the empathy of earlier reformers but also with the technical competencies necessary to deploy and manage AI-based educational interventions effectively.

Third, developers and ed-tech companies should prioritize the design of explainable AI systems, as highlighted by Robaa et al. (2024), ensuring transparency in diagnostic processes. Educational stakeholders must understand how decisions are made by AI systems to foster trust and accountability, particularly in high-stakes areas such as the diagnosis of learning disabilities.

Finally, cross-sector collaboration is essential. Policymakers should collaborate with researchers, school administrators, and community stakeholders to ensure that AI tools are culturally relevant, ethically designed, and accessible to underserved communities. The success of these technologies relies not only on their technical robustness but also on their integration into inclusive educational policy and practice. As we move toward AI-integrated classrooms, these recommendations are crucial for transforming learning environments from sites of exclusion to platforms of empowerment for learners with dyslexia and neurodiversity.

8. FUTURE RESEARCH DIRECTIONS

This study opens several promising avenues for further research. First, there is a need to deepen interdisciplinary exploration between literature, educational psychology, and AI development. Future studies could expand the literary scope beyond L'Orange de Noël, incorporating global narratives that portray learning differences in other cultural and historical settings. Doing so would provide a broader understanding of how systemic exclusion and stigma have manifested across different societies and could help identify patterns and contexts where AI might offer culturally sensitive interventions.

Secondly, future research should focus on empirical case studies that document the real-world implementation of AI tools among dyslexic learners in diverse educational environments. While this study draws on existing technological frameworks, such as those by Zhao et al. (2025) and Morciano et al. (2024), field-based investigations would provide nuanced insights into user experience, tool adaptability, and long-term outcomes. These studies should pay special attention to marginalized or low-resource communities where access to advanced educational technology is often limited. The ethical implications of AI-assisted learning remain a critical area for future exploration. Issues of data privacy, algorithmic bias, and the potential over-reliance on AI in place of human educators must be carefully studied. Research should investigate how these systems can be designed to enhance human pedagogy rather than replace it, particularly when working with vulnerable learners. Ultimately, scholars could investigate how AI might enhance the emotional and psychological well-being of neurodivergent students in educational settings. Most existing tools focus on academic performance, but future tools may incorporate features such as emotion recognition, motivational feedback, and social inclusion that holistically support the learner. By addressing these areas, future research can continue to align technological development with ethical, emotional, and cultural sensitivity, expanding the impact of AI from academic accommodation to full educational inclusion.

9. CONCLUSION

This paper has explored the historical neglect and evolving support mechanisms for dyslexic learners, using the character of Malvina Delpeuch in L'Orange de Noël as a focal point for understanding broader societal attitudes and systemic shortcomings. Through an interdisciplinary framework that bridges literary analysis and modern educational technology, the study demonstrates how artificial intelligence has not only reshaped the tools available to support neurodivergent learners but has also catalyzed a cultural shift in how such learners are perceived and valued. Historically, learners like Malvina were subject to ignorance, stigma, and misdiagnosis, often suffering under rigid educational structures that failed to recognize cognitive diversity. The compassionate but unsupported efforts of characters like Cécile illustrate the limitations of individual goodwill in the absence of systemic support. Today, however,

AI-powered tools, such as those developed by Zhao et al. (2025), Robaa et al. (2024), and Morciano et al. (2024), offer scalable, personalized, and transparent interventions that can meaningfully alter the educational trajectories of students with dyslexia.

Beyond their functional advantages, these AI systems contribute to a paradigm shift from exclusion to inclusion, from deficit to diversity. They not only diagnose and adapt but also empower learners by affirming their potential and tailoring pathways to their strengths. This transformation reflects a broader societal evolution toward educational justice, one where technology serves as both a practical aid and a philosophical statement on the value of all learners. In essence, this study confirms that integrating historical understanding with technological innovation can lead to more inclusive educational practices. It calls for continued research, thoughtful implementation, and sustained advocacy to ensure that future tools do not merely replicate the past but actively address its failures. The journey from Malvina's marginalization to modern empowerment is not yet complete. However, with conscious effort and ethical design, AI can serve as a powerful bridge between educational inequity and inclusive excellence.

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