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Leveraging Artificial Intelligence to Foster Reading Motivation Among Students of Color Struggling to Read

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Abstract

This study examines how Artificial Intelligence (AI) can improve reading motivation among students who experience literacy difficulties, particularly students of color facing linguistic, cultural, and systemic barriers. Despite advances in educational technology, many culturally and linguistically diverse learners remain disengaged from literacy instruction due to cognitive overload, limited personalization, and instructional misalignment. Adaptive AI systems, including intelligent tutoring systems and utility-based intelligent agents, offer potential to address these challenges by providing personalized and responsive learning experiences. When embedded in narrative centered, game-based environments, these systems can increase intrinsic motivation through storytelling and exploration. AI can adjust task difficulty in real time, reducing frustration and supporting sustained engagement. Integrating culturally responsive literacy practices with adaptive AI further affirms student's identities, strengthens confidence, and promotes deeper engagement. Overall, the study highlights the promise of culturally responsive, adaptive AI tools in supporting equitable and motivating literacy learning for struggling readers.

Keywords: Artificial Intelligence; Education; Learning; Motivation

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Introduction

Artificial Intelligence in education refers to the use of machine-based systems capable of performing tasks that typically require human intelligence, including decision making, pattern recognition, problem solving, and language processing, to support teaching and learning (Luckin et al., 2016; Holmes et al., 2019). In educational contexts, AI functions as both a tool and a collaborator, offering opportunities to personalize instruction, automate routine tasks, and increase student engagement. These systems adapt content, provide real time feedback, and support individualized learning pathways, positioning AI as a potentially transformative force in contemporary education (Akgun, 2021).

Holmes et al. (2019) describe AI in education as encompassing technologies such as intelligent tutoring systems, adaptive learning environments, automated feedback tools, and natural language processing applications. By analyzing large amounts of student data, these tools can tailor instruction and predict learning trajectories. While such capabilities can improve learning efficiency and personalization, Holmes et al. emphasize that AI implementation must be guided by strong ethical and pedagogical considerations.

Luckin et al. (2016) define AI in education as computer systems that perform tasks traditionally associated with human intelligence while adapting their operations based on learner data. They identify four primary functions of AI in educational settings: personalization of instruction, automated assessment, timely feedback, and instructional support through virtual tutoring or assistance. Recent scholarship expands this view by emphasizing that AI systems are not neutral technologies, but socio technical tools embedded within cultural and institutional contexts.

Research has highlighted ethical concerns related to AI use in education, particularly around privacy, fairness, and trust. Latham and Goltz (2019) found that while the public recognizes the potential benefits of AI supported learning, there is also concern about transparency, data use, and reduced human oversight. Their findings underscore the importance of maintaining educator judgment and ethical safeguards in AI supported instruction.

Equity focused perspectives further stress the need for culturally responsive AI design. Holstein et al. (2020) argue that AI systems must account for student's identities, community experiences, and social contexts to avoid reinforcing existing inequities, particularly for students of color. Similarly, literacy research shows that instructional tools must reflect learner's cultural and familial knowledge to support engagement and belonging. Compton Lilly et al. (2023) demonstrate that when educational tools align with student's lived experiences, learners develop stronger literacy identities and motivation.

Akgun (2021) reinforces these concerns, noting that many AI applications lack built in ethical safeguards, which can lead to biased outcomes and the exclusion of minoritized learners. Together, this body of research calls for AI systems that extend beyond technical efficiency to support culturally responsive, ethical, and inclusive educational practice.

Review of Literature

AI for Adaptive and Personalized Learning

Artificial Intelligence technologies have become increasingly influential in personalized education by enabling instruction to respond dynamically to learner performance. Intelligent Tutoring Systems and adaptive learning platforms adjust content, pacing, and feedback based on student responses, offering differentiated pathways and scaffolding in real time. By analyzing learner data, these systems tailor instruction to individual needs and have been shown to improve academic outcomes. (Shute & Rahimi, 2021)

However, most adaptive systems prioritize cognitive personalization while giving limited attention to cultural, motivational, or identity-based dimensions of learning. Shute and Rahimi (2021) note that although AI tools effectively individualize academic support, they often fail to reflect student's cultural backgrounds or lived experiences. This limitation is particularly consequential for students of color and multilingual learners, whose engagement with literacy is shaped by identity, belonging, and representation (Shute & Rahimi, 2021).

Research grounded in Vygotsky's Zone of Proximal Development further demonstrates the instructional benefits of adaptive AI. Ferguson et al. (2021)show that AI systems can maintain learners within an optimal challenge range by adjusting task difficulty and support in response to performance. When learners consistently operate within this range, engagement increases and cognitive overload decreases outcomes that are especially important for struggling readers. Yet, as with other adaptive systems, this work does not address how cultural relevance or identity-based motivation interacts with adaptive guidance.

This gap reflects a broader trend in AI-supported learning. While many systems succeed in personalizing instruction cognitively, they fall short in addressing the cultural and motivational factors that strongly influence literacy engagement. Research in culturally responsive and culturally sustaining pedagogy emphasizes that reading motivation is deeply connected to student's cultural identities, community experiences, and opportunities for representation (Compton-Lilly et al., 2023; Mucherah & Yoder, 2008). When AI tools overlook these dimensions, they risk reinforcing inequities and failing to address the root causes of disengagement among struggling readers.

These limitations are particularly evident in AI-enhanced learning environments designed to increase engagement. As educational technologies evolve from traditional tutoring systems to interactive and game-based platforms, it becomes clear that adapting instruction to skill level alone is insufficient. Engagement depends not only on task difficulty but also on whether learning experiences feel meaningful, supportive, and connected to learner's identities. This shift emphasizes the importance of examining how AI-based games and inquiry tools influence motivation and where they continue to fall short.

Game-Based Learning, Flow, and Engagement

AI-powered gamified learning environments offer promising opportunities to support engagement through absorbed engagement and intrinsic motivation. Hamari et al. (2016) found that well-designed educational games can promote engagement, enjoyment, and sustained motivation. When paired with AI, these learning environments adjust feedback to

match student's abilities, helping tasks feel challenging but manageable and encouraging students to keep trying and feel confident (Hamari et al., 2016).

Similarly, Shute et al. (2017) show that calibrated challenge and immediate feedback increase learner motivation in game-based environments. However, these studies do not explicitly examine how culturally relevant narratives, characters, or linguistic representations shape motivation for diverse learners.

Recent research further highlights these gaps. Studies of AI-based reading platforms suggest that gamification and immediate feedback can increase short-term engagement, but deeper comprehension and sustained motivation emerge when AI tools are paired with explicit instruction and teacher mediation (Silor & Silor, 2025; Shafiee Rad, 2025). However, although conversational AI tools can encourage inquiry and engagement, equity-focused research shows that these systems frequently privilege performance metrics over culturally responsive and identity-affirming design, limiting their motivational impact for historically marginalized learners (Holstein et al., 2020).

Taken together, this literature reveals a consistent pattern: while AI systems can foster engagement and inquiry, they rarely integrate culturally affirming narratives or identity-based motivational supports. For students whose lived experiences differ from dominant curricular norms, this omission remains a significant limitation (Paris & Alim, 2017).

Culturally Responsive Literacy and Motivation

Recent scholarship has begun to bridge artificial intelligence, literacy instruction, and culturally responsive pedagogy. Research in culturally sustaining literacy demonstrates that instructional materials reflecting student's cultural identities, linguistic practices, and community histories significantly strengthen reading motivation and engagement among Black and other historically marginalized students (Compton-Lilly et al., 2023; Paris & Alim, 2017). Embedding such materials within AI-supported platforms offers the potential to combine cognitive scaffolding with cultural affirmation, addressing both academic and motivational needs. Equity-oriented research in AI further emphasizes that learning technologies must be designed with attention to learner's identities, social contexts, and lived experiences to avoid reinforcing existing inequities (Holstein et al., 2020; Benjamin, 2019). Together, this body of work underscores that effective AI-supported literacy instruction requires not only technical adaptivity but also intentional, culturally responsive design. Holstein et al. (2020) argue that AI systems must be intentionally designed to account for student's social and cultural contexts in order to avoid reproducing inequities. Similarly, research in culturally sustaining literacy demonstrates that when instructional materials affirm student's identities and community knowledge, learners show greater motivation, engagement, and persistence with reading (Paris & Alim, 2017; Compton-Lilly et al., 2023). Together, these studies establish that cultural affirmation is central to literacy motivation and must be intentionally embedded within AI-supported learning systems to promote equitable outcomes.

Why AI Should Be Leveraged to Foster Motivation among Struggling Readers

Struggling readers, particularly those from culturally and linguistically marginalized communities, face barriers that extend beyond decoding difficulty. Research on reading motivation consistently shows that engagement with text is shaped by beliefs about

competence, perceived value of reading, and the cultural relevance of instructional materials (Guthrie & Wigfield, 2000). These challenges are intensified for multilingual and foreign-born Black learners who often encounter instructional environments shaped by deficit expectations or cultural misalignment. Studies documenting the experiences of Black youth show how racialized schooling, stereotype threat, and negative literacy identities suppress motivation and persistence (Tatum, 2009). Family literacy scholarship further emphasizes that motivation is rooted in community histories, cultural practices, and identity affirmation, conditions frequently absent in traditional interventions (Compton-Lilly et al., 2023). Collectively, this work underscores that motivation is a core driver of reading development rather than a secondary outcome.

Artificial intelligence offers a unique opportunity to intervene in these motivational trajectories by providing adaptive and responsive support that is difficult to sustain in conventional instruction. AI systems can adjust task difficulty in real time to maintain learners within an optimal challenge range that is demanding but manageable, reducing disengagement commonly observed among struggling readers (Ferguson et al., 2022; Shute & Rahimi, 2021). This capacity is particularly important because cognitive overload is a documented source of frustration and avoidance for learners with reading difficulties (Smith, 1996; Ferguson & van Oostendorp, 2020).

AI systems can also personalize content and feedback to reflect student's cultural and linguistic identities, a central principle of culturally responsive literacy pedagogy and a well-established contributor to increased motivation among students of color (Mucherah & Yoder, 2008; Castillo & Wagner, 2019; Paris & Alim, 2017). When instruction feels meaningful, supportive, and identity affirming, students demonstrate stronger motivation, engagement, and comprehension (Guthrie & Wigfield, 2000). Struggling readers further benefit from immediate, detailed, thoughtful, and sensitive feedback that reinforces effort and self-efficacy. AI tools are well positioned to provide such feedback consistently, particularly in classrooms where teachers face heavy workloads and limited access to specialists (Shute et al., 2017; Hattie & Timperley, 2007)).

Despite these affordances, most AI literacy tools remain disconnected from decades of research on reading motivation, identity, and sociocultural learning. Current systems often prioritize efficiency and performance metrics while overlooking relational and identity-driven factors that shape literacy persistence, particularly for foreign-born and multilingual learners (Solari et al., 2022; Smith et al., 2020). Research in culturally grounded literacy shows that students are more motivated when instruction affirms belonging, representation, and family literacy practices, yet these principles are rarely incorporated into AI design. This reveals a critical gap that while adaptive AI and culturally responsive literacy are studied separately, their integration with an explicit focus on motivation remains underdeveloped, leaving students with the greatest needs being underserved by emerging technologies.

Designing AI for Educational Equity

Designing AI to support reading motivation among struggling readers of color requires explicit attention to educational equity. Research increasingly shows that decisions about who designs AI systems, whose knowledge is embedded, and what assumptions guide development shape whether these tools expand or restrict learning opportunities. Holstein et al. (2020) argue that AI systems must be designed to support equitable instructional decision-making rather than prioritizing efficiency or performance alone. Similarly, Benjamin (2019)

report that culturally aligned AI literacy platforms increased reading motivation among Black and Latinx students, particularly when learners recognized themselves in characters, narratives, and themes. These findings underscore that cultural affirmation is not peripheral but central to how students engage with and persist in literacy learning.

Together, this work highlights that AI tools which center student's cultural realities can function as engines of both motivation and equity. Realizing this potential, however, requires intentional design choices, diverse development teams, and a commitment to anti-deficit frameworks. Scholars also emphasize the need for future research examining long-term motivational outcomes, the role of real-time feedback in sustaining engagement, and how culturally responsive AI functions across varied educational contexts. At the policy level, expanding definitions of literacy success and challenging deficit narratives are necessary to support more inclusive AI-supported literacy practices.

Concluding Remarks

Despite these promising directions, the broader literature reveals a persistent disconnect between adaptive AI technologies and culturally responsive, motivation-centered literacy frameworks. Across the 21 studies reviewed, research consistently demonstrates that adaptive AI systems can enhance learning and engagement through personalization and real-time feedback. However, attention to cultural and motivational dimensions remains uneven. Of the 21 studies, 14 focus primarily on cognitive adaptivity, efficiency, or performance outcomes, with minimal attention to learner's identities or motivational experiences. Four studies examine culturally responsive literacy practices independent of AI, emphasizing representation, identity, and community-based literacies, while three focus on reading motivation without integrating adaptive AI technologies. Notably, only two studies explicitly address the intersection of adaptive AI, culturally responsive design, and motivation-centered literacy instruction.

This imbalance reveals a significant gap in the literature. Although adaptive AI and culturally responsive literacy are each well established, their integration remains limited, particularly for struggling readers from culturally and linguistically marginalized backgrounds. As a result, existing research provides insufficient guidance on how AI-driven literacy tools can both sustain reading motivation and affirm learner's cultural identities. This study responds to this gap by examining how adaptive, culturally responsive AI interventions can support reading motivation, contributing to more equitable and motivation-centered approaches to AI-supported literacy instruction.

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