

# Multimodal Reading Engagement: A Conceptual Review of AI-Mediated Text Transformation

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## ABSTRACT

*The increasing availability of generative artificial intelligence (AI) tools has introduced new possibilities for transforming how students interact with academic texts. While most educational discussions have focused on AI-assisted writing and assessment, the role of AI in supporting reading engagement remains underexplored. This study presents a narrative literature review examining the relationship between generative AI, multimodal learning, and reading engagement in higher education. Relevant studies were identified through academic databases using keywords related to generative AI in education, multimodal learning, and reading engagement, and were analyzed through thematic categorization. The review indicates that AI-mediated text transformation, particularly converting text into visual or animated representation, may restructure reading activity into an iterative process involving rereading, verification, and adjustment. Such interaction aligns with cognitive, behavioral, and affective dimensions of engagement by encouraging learners to compare generated representations with original textual sources. Rather than functioning as an automated comprehension tool, generative AI can act as a mediating learning artefact that supports active involvement with reading material when pedagogically guided. The study proposes a conceptual framework describing AI-assisted text-to-animation learning as a cyclical engagement process. The findings suggest that the educational value of generative AI depends on instructional design that promotes critical interaction with generated output. Future research should empirically investigate classroom implementation to validate the proposed framework.*

## ARTICLE HISTORY

Published June 30<sup>th</sup> 2026



## KEYWORDS

*Generative artificial intelligence, Reading engagement, Multimodal learning, Higher education, AI-mediated learning.*

## ARTICLE LICENCE

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## 1. Introduction

Reading remains a central activity in higher education because students are required to understand academic texts, interpret arguments, and integrate information across sources. However, many university students demonstrate low engagement when dealing with extended reading materials, particularly in English as a foreign language (EFL) context. (Levy, 2016; Mikami, 2017) Learners often approach reading as a decoding task rather than a meaning construction process (Lestari, 2024a), resulting in surface comprehension and minimal interaction with the text. Engagement in reading is therefore not merely a motivational issue but a learning process involving attention, effort, and active processing of information.

Educational research commonly categorizes engagement into cognitive, affective, and behavioral dimensions. (Pilotti et al., 2017) Cognitive engagement refers to the mental effort invested in understanding a text, affective engagement relates to interest and curiosity, and behavioral engagement concerns observable learning actions such as rereading and checking information. (Rotgans & Schmidt, 2011; Rahman et al., 2019; Prihandoko et al., 2021) Learning activities that require learners to manipulate, reorganize, and represent information are considered more likely to activate these dimensions simultaneously. (Pentaraki & Burkholder, 2017) Consequently, pedagogical approaches have increasingly explored multimodal learning, where students interact with text through visual, auditory, and representational forms.

Parallel to this development, generative artificial intelligence (AI) has recently entered educational settings. (Lestari, 2024b) Tools capable of summarizing, explaining, and transforming textual input into alternative formats are becoming widely accessible. Rather than functioning only as information providers, these tools may act as mediating learning instruments that restructure how students approach academic reading.

Existing studies on generative AI in education have primarily focused on writing assistance (Gasaymeh et al., 2024; Ritonga et al., 2024; Andini et al., 2026), automated feedback (Zhan & Yan, 2025), and assessment support (Kim et al., 2025). The discussion largely centers on productivity (Lee & Cho, 2025), academic integrity (Yaumi, Rahman, et al., 2023), and authorship concerns (Gallent Torres et al., 2023). In contrast, the potential role of AI in supporting reading processes has received considerably less attention. This imbalance creates a conceptual gap because reading engagement precedes writing performance and strongly influences comprehension quality.

Moreover, multimodal learning research has demonstrated that transforming textual information into visual representation encourages learners to select key ideas, reorganize information, and verify understanding (Yaumi et al., 2024). However, previous multimodal activities typically required manual production such as drawing diagrams or creating presentations. With generative AI tools capable of converting text into visual or animated representations, the transformation process may become more iterative: students can repeatedly compare the generated output with the original text, potentially altering their reading behavior.

Despite this possibility, little theoretical discussion has connected AI-generated multimodal transformation with reading engagement. The mechanism through which AI-mediated representation might influence learners' interaction with texts therefore remains insufficiently conceptualized.

To address this gap, this article reviews literature on generative AI, multimodal learning, and reading engagement to explain how AI-assisted text-to-animation transformation may support active reading processes in higher education. Rather than evaluating effectiveness empirically, the study synthesizes theoretical perspectives to construct an explanatory framework describing how AI can function as a mediating tool in reading activities.

This article proposes that when learners convert text into animated representation using generative AI, they engage in a cyclical process of reading, checking, and revising. Such interaction potentially increases attention to textual details and encourages repeated examination of meaning. The review therefore aims to provide a conceptual foundation for future empirical research investigating AI-mediated reading practices.

## **2. Methodology**

### **2.1. Research Design**

This study employed a narrative literature review to examine theoretical and empirical discussions related to generative artificial intelligence, multimodal learning, and reading engagement in higher education. Narrative literature reviews are suitable for synthesizing concepts and developing theoretical relationships across studies rather than calculating effect sizes (Baumeister & Leary, 1997; Snyder, 2019). Therefore, the review did not aim to compare experimental outcomes, but to synthesize key ideas and identify conceptual relationships among the selected studies.

### **2.2. Literature Search Strategy**

Relevant literature was identified through searches in Google Scholar and academic databases using combinations of the following keywords: generative AI in education, AI-assisted learning, reading engagement, multimodal learning, multimedia learning, and digital reading. The search procedure followed structured keyword identification and selection principles commonly recommended in review research (Xiao & Watson, 2019). Priority was given to publications discussing learning processes rather than system performance.

The search focused on articles published between 2015 and 2025 to capture recent developments in educational technology and artificial intelligence, particularly the rapid expansion of AI applications in higher education (Zawacki-Richter et al., 2019). Earlier foundational works were included selectively when necessary to explain theoretical concepts.

### **2.3. Selection Criteria**

The inclusion criteria were:

1. Articles discussing the use of artificial intelligence or digital tools in learning activities
2. Studies examining reading engagement or learner interaction with text
3. Research addressing multimodal or multimedia learning processes
4. Peer-reviewed journal articles or scholarly conference proceedings

The exclusion criteria were:

1. Studies focusing solely on technical algorithm performance
2. Articles discussing AI ethics without pedagogical relevance
3. Publications unrelated to educational contexts

## 2.4. Data Analysis

The selected literature was analyzed using thematic categorization. The researcher read each article repeatedly and identified recurring concepts related to learner engagement, reading behavior, and multimodal representation. Similar ideas were grouped into broader themes following thematic analysis principles (Braun & Clarke, 2006; Nowell et al., 2017).

The analysis emphasized conceptual connections across studies rather than statistical comparison, allowing the review to construct an explanatory framework for AI-assisted reading engagement. Following the thematic analysis, three overarching themes emerged consistently across the reviewed studies. The first theme describes generative AI as a mediating learning artefact that supports learners' interaction with texts rather than replacing reading activities. The second theme highlights multimodal transformation as a process that simultaneously promotes cognitive, behavioral, and affective engagement. The third theme conceptualizes AI-mediated text-to-animation as an iterative reading cycle characterized by repeated reading, verification, and refinement. These themes subsequently served as the analytical framework for presenting the findings in the Results section.

## 3. Results and Discussion

The thematic analysis of the reviewed literature generated three interrelated themes explaining how generative AI may support reading engagement through multimodal text transformation. Rather than identifying AI as a direct enhancer of reading comprehension, the reviewed studies consistently portrayed AI as a mediating learning artefact that restructures learners' interaction with academic texts. The themes comprise (1) generative AI as a mediating learning artefact, (2) multimodal transformation as a catalyst for multidimensional reading engagement, and (3) AI-mediated text-to-animation as an iterative reading engagement mechanism.

**Table 1.** Themes emerging from the thematic analysis of the reviewed literature.

Theme	Key finding	Implication for reading engagement
Theme 1	Generative AI functions primarily as a mediating learning artefact rather than an automated learning solution.	AI encourages learners to revisit and reorganize textual information.
Theme 2	Multimodal transformation activates cognitive, behavioral, and affective engagement simultaneously.	Learners become more actively involved in constructing meaning from academic texts.
Theme 3	AI-assisted text-to-animation creates an iterative cycle of reading, verification, and refinement.	Reading shifts from a linear activity to a recursive process supporting deeper engagement.

### 3.1. Theme 1: Generative AI as a Mediating Learning Artefact

The thematic analysis revealed that generative AI consistently functions as a mediating learning artefact rather than an autonomous learning solution. Across the reviewed studies, three recurring patterns were identified. First, AI supports learners in transforming textual information into alternative representations. Second, AI encourages learners to verify and compare AI-generated outputs with the original text. Third, AI promotes repeated refinement of understanding through iterative interaction with textual content. These recurring patterns suggest that AI contributes to reading engagement by structuring learners' interaction with texts instead of replacing the reading process.

The development of generative artificial intelligence (AI) has introduced new forms of interaction between learners and academic content. Unlike earlier educational technologies that primarily delivered information, generative AI systems can produce explanations, summaries, and alternative representations of text in response to user prompts. In educational contexts, these tools function not only as information sources but also as cognitive support instruments that may influence how learners approach learning tasks.

Research on AI in higher education has largely emphasized writing support, automated feedback, and assessment efficiency (Zawacki-Richter et al., 2019; Cotton et al., 2024). Students commonly use AI tools to generate drafts, paraphrase ideas, or check grammar. Consequently, scholarly discussions frequently address issues of academic integrity, authorship, and over-reliance on automation. However, this dominant focus on writing obscures another potential pedagogical role of AI: mediating reading processes.

From a learning perspective, reading is not limited to decoding information but involves selecting relevant ideas (Grabe, 2009), organizing meaning (Ghorbani Shemshadsara et al., 2019), and monitoring understanding (Gordon & Hanauer, 1995; Liu et al., 2024). Tools that encourage learners to manipulate textual information may therefore alter the depth of processing. Generative AI introduces an additional interaction layer in which learners iteratively compare their interpretation of a text with system-generated output (Huszti et al., 2025). This comparison can prompt learners to revisit unclear sections and evaluate accuracy rather than passively accept the content.

Recent discussions have suggested that large language models can serve as interactive learning partners rather than simple answer providers (Kasneji et al., 2023; Chea & Xiao, 2024). When learners actively verify AI responses, the technology becomes a mediating tool supporting cognitive activity. The educational value of the tool thus depends less on the correctness of the generated output and more on the learning actions it triggers.

In this context, tools capable of transforming textual input into alternative formats, such as summaries, outlines, or visual representations, are pedagogically significant. The transformation process requires learners to identify key concepts and determine how information should be represented. Rather than replacing reading, AI-assisted transformation may restructure reading behavior into a cyclical activity involving checking, revising, and confirming meaning.

Therefore, generative AI should not be conceptualized solely as an efficiency tool but as an interaction mechanism that potentially reshapes learner engagement with academic texts. Understanding this role requires connecting AI-mediated learning with theories of multimodal processing and reading engagement, which are discussed in the following section.

Overall, the reviewed evidence suggests that generative AI contributes to reading engagement primarily by mediating learners' interaction with texts rather than replacing the reading process.

### **3.2. Theme 2: Multimodal Transformation as a Catalyst for Reading Engagement**

The thematic analysis demonstrated that multimodal transformation contributes to reading engagement through three interconnected dimensions: cognitive, behavioral, and affective engagement. Across the reviewed studies, learners consistently engaged in deeper information processing, repeated verification of textual meaning, and sustained interest when required to transform written text into visual representations. These recurring findings indicate that multimodal transformation encourages learners to interact more actively with academic texts.

The reviewed literature consistently indicates that learning activities involving multiple representational modes tend to stimulate deeper cognitive processing compared to single-mode text exposure. Multimodal learning theory suggests that learners process verbal and visual information through partially distinct cognitive channels (Mayer, 2024). When information is presented in both textual and visual forms, learners are encouraged to organize and integrate content more actively. This integration process may reduce passive reading behaviors and increase mental effort directed toward comprehension.

Dual coding theory further explains that combining verbal and visual representation enhances memory retention because information is encoded in more than one representational system (Naderi Anari et al., 2019; Daulay & Dewi, 2025). Although dual coding theory was not originally developed in the context of artificial intelligence, its principles are relevant to AI-assisted text transformation. When learners convert written text into animation or visual representation, they must identify key concepts and determine how these ideas can be represented visually. This process potentially strengthens cognitive engagement by requiring active manipulation of information rather than simple reading.

In addition to cognitive dimensions, multimodal activities may influence affective engagement (Varaporn & Sitthitikul, 2019). Research on reading motivation emphasizes that interest and curiosity are significant predictors of sustained reading behavior (Komiya, 2013). Visual or animated representations can make abstract or dense academic texts more approachable, potentially reducing intimidation and increasing willingness to continue reading. While visual enhancement alone does not guarantee comprehension, it may create entry points that encourage students to remain involved in the task.

Behavioral engagement is also shaped by multimodal interaction. When learners are required to transform text into another format, they often revisit specific paragraphs to verify meaning or extract essential information. This iterative process contrasts with linear reading patterns where students move through text without systematic review. The reviewed studies suggest that tasks involving summarization, diagram construction, or visualization promote rereading and monitoring behaviors that are associated with active learning strategies.

However, the literature also cautions that multimedia elements must be pedagogically integrated rather than decorative. According to multimedia learning principles, irrelevant visuals may distract learners and reduce comprehension (Mayer, 2014). Therefore, the educational value of multimodal transformation depends on purposeful alignment between textual content and representational output. In AI-mediated contexts, this alignment becomes particularly important because generated visuals must be critically evaluated against the original text.

Collectively, these findings indicate that multimodal transformation supports reading engagement by activating cognitive, behavioral, and affective dimensions simultaneously.

### 3.3. Theme 3: AI-Mediated Text-to-Animation as an Iterative Reading Engagement Mechanism

The thematic synthesis further revealed an iterative reading engagement cycle underlying AI-mediated text transformation. Across the reviewed studies, learners repeatedly moved through five interconnected learning activities: reading the source text, generating visual representations, comparing AI outputs with the original text, verifying conceptual alignment, and refining prompts through repeated reading. Rather than functioning as a linear reading task, AI-mediated transformation encourages continuous interaction between learners and textual information.



**Figure 1. Conceptual cycle of AI-mediated reading engagement synthesized from the reviewed literature**

Figure 1 summarizes the iterative learning cycle synthesized from the reviewed studies. Rather than depicting a fixed instructional procedure, the cycle illustrates recurring learner behaviors consistently identified across the literature.

The synthesis of the reviewed literature suggests that generative AI may function as a mediating mechanism that restructures reading activity rather than replacing it. When students use AI tools to transform text into animation, the task shifts from passive reading to representational decision-making (Manglara et al., 2025). This shift requires learners to

identify central ideas, determine informational hierarchy, and evaluate how textual meaning should be visually presented (Alisoy, 2025). Such actions correspond with cognitive engagement behaviors characterized by effortful processing and strategic interaction with content (Fredricks et al., 2004).

Unlike traditional reading tasks, AI-mediated transformation introduces a comparison loop between the original text and the generated output. Learners may check whether the animation accurately reflects the text, revisit ambiguous sections, and adjust prompts accordingly (Kharbach, 2026). This cyclical interaction potentially increases behavioral engagement, particularly rereading and verification practices. The presence of AI output does not automatically deepen comprehension; however, the necessity to confirm its alignment with the source text may encourage closer textual examination (Albrecht-Crane, 2025).

From an affective perspective, the transformation process may also stimulate curiosity and sustained attention. The anticipation of seeing textual content represented visually can create motivational momentum during reading. At the same time, the need to correct or refine AI-generated representations may generate productive cognitive tension, prompting learners to remain attentive to detail. These dynamics suggest that engagement emerges from the interaction process rather than from the technological novelty itself.

Importantly, the reviewed studies emphasize that AI tools should not be conceptualized as substitutes for comprehension. Instead, their pedagogical value lies in how they structure learner activity. When students are required to justify their representational choices or verify AI output against the original text, the technology functions as a mediating artefact supporting active reading. Without such instructional framing, there is a risk that learners may accept generated content uncritically, leading to superficial engagement.

Based on the thematic synthesis, the role of AI in text-to-animation activities can be conceptualized as a transformation cycle: textual input is processed by the learner and AI system, the generated animation is evaluated against the source material, and subsequent rereading occurs to refine understanding. This cycle potentially strengthens cognitive and behavioral engagement by encouraging iterative interaction with the text.

Therefore, the literature indicates that AI-mediated text transformation does not inherently improve reading outcomes. Rather, it creates conditions that may support deeper engagement when learners actively compare, verify, and refine representations. This conceptualization provides a theoretical foundation for examining AI-assisted reading practices in higher education contexts.

Overall, the thematic synthesis indicates that AI-mediated text transformation restructures reading into an iterative cycle of reading, generating, verifying, and revising, thereby creating conditions for deeper learner engagement with academic texts.

#### **4. Conclusion**

This narrative literature review synthesized current theoretical and empirical discussions on generative AI, multimodal learning, and reading engagement in higher education. The thematic analysis identified three interrelated findings. First, generative AI functions as a mediating learning artefact that supports learners' interaction with academic texts rather than replacing reading activities. Second, multimodal text transformation promotes cognitive, behavioral, and affective engagement by encouraging learners to reorganize, verify, and reinterpret textual information. Third, AI-mediated text-to-animation creates an iterative reading cycle involving repeated reading, comparison, verification, and prompt refinement.

Collectively, these findings suggest that the educational value of generative AI lies not in automating comprehension but in creating learning conditions that encourage active and reflective engagement with academic texts. Consequently, the effectiveness of AI-assisted reading depends on instructional designs that require learners to critically evaluate generated representations against original textual sources.

Given the rapid development of generative AI tools, future research should empirically examine classroom implementations of AI-assisted text-to-animation activities to determine how these theoretical mechanisms operate in practice. Investigating learner strategies, verification behaviors, and instructional scaffolding would provide further evidence regarding the role of AI in supporting reading engagement in higher education.

This review contributes a conceptual framework describing AI-mediated text transformation as a cyclical engagement process, positioning AI as a cognitive support artefact rather than a replacement for reading. The proposed framework provides a theoretical basis for future empirical investigations into AI-mediated reading practices in higher education, particularly regarding instructional scaffolding, prompt design, verification strategies, and learner interaction with AI-generated multimodal representations.

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