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Operationalizing SAMR Redefinition in EFL Reading: AI as a Mediating Tool for Literacy Innovation

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Abstract: This study examines how Artificial Intelligence (AI) can leverage the concept of Redefinition—the highest level of the Substitution-Augmentation-Modification-Redefinition (SAMR) model—to transform the teaching of English as a Foreign Language (EFL) reading from comprehension-focused activities to inquiry-driven and effective reading and writing activities. Based on socio-cultural theory, Project-Based Learning (PBL), and theoretical frameworks of digital competence, this study conceptualizes AI as a cognitive mediating framework that supports knowledge transformation rather than task automation. Using a multi-method action research design, interventions were conducted with 130 Vietnamese university students enrolled in intermediate-level English reading courses over eight weeks. Traditional reading activities were redesigned into AI-assisted projects, including multimedia infographics, podcasts, and investigative reading tasks. Quantitative data were collected through a validated 40-item questionnaire, and qualitative insights were gathered from semistructured interviews with six purposefully selected participants. The study results indicate that AI-assisted redefined reading tasks promoted higher-order thinking, synthesis, and practical application, demonstrating the successful implementation of the SAMR Redefinition methodology. Students perceive AI as a supportive learning partner, enhancing comprehension, reducing frustration, and increasing motivation and confidence. A fairly strong positive correlation ($r = 0.62$) was found between purposeful AI use and student engagement and reading performance. Qualitative results further suggest that AI supports continuous reading, collaborative preparation, and multimodal knowledge building, while encouraging responsible and critical use of AI. The study proposes an AI-powered SAMR framework and a pedagogical sequence of read-interpret-transform-create, providing a scalable model for teaching English as a transformative foreign language reading.

Keywords: SAMR Redefinition; AI-Supported Reading; EFL Pedagogy; Digital Literacy; Project-Based Learning (PBL); Learner Engagement

1. Introduction

The integration of digital technologies into English language teaching has accelerated over the past decade, reshaping literacy activities and expanding opportunities for interactive learning. In particular, teaching reading of English as a Foreign Language (EFL) has gradually shifted from teacher-led reading comprehension activities to a more student-centered, technology-supported environment [1]. However, much of this adoption remains at a lower level, with digital texts, online assignments, or e-books primarily reproducing rather than transforming traditional reading activities [2]. As a result, learners often remain passive recipients of information rather than active meaning-builders. To overcome this limitation, scholars call for pedagogical innovation that not only enhances comprehension but also fosters higher-order literacy, creativity, and independent inquiry based on social constructivist

learning [3].

The Substitution-Augmentation-Modification-Redefinition (SAMR) framework provides a lens through which to assess the depth of technology integration. A critical analysis of the stages and implications of SAMR for instructional design shows that of its four levels [1,4], Redefinition represents the highest stage, where technology enables the performance of learning tasks that would otherwise be unimaginable. While SAMR is widely referenced, empirical work in language education often focuses on Substitution and Augmentation, digitizing spreadsheets or embedding vocabulary tools, leaving a gap in how Redefinition impacts classroom reading, engagement, and literacy development [5].

Simultaneously, rapid advances in Artificial Intelligence (AI) have opened up new possibilities for redefining literacy tasks. AI-powered platforms (e.g., large language models, intelligent writing assistants, multimodal design tools) can support comprehension and vocabulary while enabling knowledge transfer, collaborative learning, and digital composition [6]. Recent studies report that AI-powered generative activities can promote learner autonomy and co-construction when instruction is purposefully designed [7]. Research on project-based learning and digital literacy similarly emphasizes that meaningful technology integration depends on authentic task design and learner preparedness, rather than tool substitution [8–10]. Although systematic reviews identify potential gains in learning outcomes, they also caution that benefits diminish when AI is used superficially [11, 12]. Accordingly, most classroom implementations align with the Augmentation level of SAMR (e.g., rephrasing or summarizing existing work), with limited evidence of Redefinition, where AI enables qualitatively new forms of collaboration, inquiry, or knowledge construction.

To operate Redefining in reading guidance, this research relies on Project-Based Learning (PBL) and digital literacy theory. PBL promotes purposeful knowledge application through authentic projects, relevant to real-world literacy practices and reader autonomy [8]. Simultaneously, experiential and multiliteracies frameworks foreground meaning-making through active engagement, multimodal composition, and collaborative knowledge construction, positioning technology not merely as a channel for transmission but as a medium for creating and transforming meaning [13–16].

Despite strong theoretical links, practical guidance remains limited on how to design and implement SAMR-Redefine reading tasks in structured EFL programs, particularly at the transitional level where learners move from general English to academic and professional literacy. Current work has not adequately considered how AI-assisted Redefine tasks affect learner engagement, depth of understanding, and cognition in these courses [12]. To address this gap, the present study redesigned traditional reading activities into AI-enhanced Redefine tasks and examined their impact through a mixed-methods action study, transforming three objectives: (1) redesigning reading activities at the Redefine level with AI-based tools; (2) exploring student perceptions of these tasks; and (3) examining the impact on reading engagement and performance.

To achieve the research objectives, the following research questions were addressed:

- RQ1: How do AI-assisted redefined reading tasks differ from traditional reading activities in English as a Foreign Language (EFL) schools at the Redefinition level of the SAMR model?
- RQ2: What are students' perceptions of AI-assisted redefined reading tasks?
- RQ3: How have AI-assisted redefined reading tasks affected student engagement and reading performance?

2. Literature Review

2.1. SAMR Model and Redefinition in Education

The SAMR model describes a continuous process from enhancement to transformation of learning tasks. In the Substitution and Augmentation phase, technology digitizes or improves existing activities with limited pedagogical change; in the Modification and Redefinition phase, it allows for redesign and tasks previously unimaginable [1,4].

When understood as a design framework rather than a tool classification system, SAMR can guide innovation aimed at deeper learning [1]. However, misapplication is common: educators may treat SAMR as a hierarchical checklist, stacking tools on top of traditional processes without redesigning cognition or assessment [1]. In language education, this tends to help explain why practice often stalls below the Redefinance phase [5].

Redefining aligns with socio-cultural perspectives that emphasize collaborative, mediated, and authentic task engagement [3]. In redefined tasks, learners connect, create, and publish to a real audience-activities that high-

light authorship, creativity, and actionability within the digital ecosystem. Robust implementation further benefits from complementary frameworks that foreground critical literacy, higher-order cognitive outcomes, and iterative design processes, thereby orienting technology use toward analysis, creation, and social meaning-making rather than passive consumption [17–21]. Design-oriented and formative research perspectives additionally emphasize product-oriented and public-facing outcomes within iterative cycles, helping ensure that technology use supports purposeful knowledge construction instead of superficial novelty [22].

However, empirical evidence on Redefining in EFL reading classrooms remains limited. Many lessons stall at the Revision stage due to limitations in pedagogical methods, assessment, or teacher confidence [5]. This underscores the need for specific design models that translate Redefining into a series of tasks, assessment criteria, and reflective learning support.

2.2. AI Integration in Language and Reading Pedagogy

AI has emerged as a transformative force in language education, providing adaptive support, feedback, and effective assistance. Reviews show that language learning enhanced by technology improves outcomes as tools guide exploration and use strategies rather than replacing cognition [6]. With conversational and multimodal capabilities, modern AI can mediate interactive reading: learners ask questions, check interpretations, and demonstrate understanding through dialogue and product creation. Systematic reviews focusing on AI generation in EFL/ESL show prospects for personalization, feedback, and formative assessment, while warning that benefits depend on teaching intent and critical prompting [11,12].

Specifically in reading instruction, AI can assist in summarizing, vocabulary development, annotation, and question generation functions that, when integrated into PBL and multimodal reading-writing design, will shift reading from decoding to knowledge production. Evidence suggests that generative AI can facilitate autonomy and co-construction of knowledge when used with instruction and accountability measures [7]. On the contrary, without a structured design, learners may become overly reliant on AI, leading to superficial engagement or integrity issues. Therefore, responsible integration requires clear frameworks for verifying AI output, identifying sources, and reflecting on the process [5,12].

2.3. Project-Based Learning and Digital Literacy

PBL engages learners in an extended inquiry process around complex questions and verifiable products provided, positioning students as active agents and linking assessment with the application and transmission of knowledge [8]. Its philosophical origins in Dewey and experiential learning shape knowledge constructed through cycles of experience, reflection, conceptualization, and application [13, 14]. These cycles naturally fit into the iterative redesign of reading tasks and artifacts.

The Digital and Multi-Competency Framework further argues that contemporary literacy involves designing meaning across linguistic, visual, auditory, and spatial modes, often within engaging networks [9, 15]. From this perspective, technology acts as an environment for drafting, collaborating, and publishing, not merely for accessing text. Therefore, linking PBL with digital competence creates the conditions for transformation at the SAMR level: students plan, model, and publish multimodal products that extend the meaning of text; they critique sources, integrate perspectives, and communicate with authentic audiences [3,15,22].

2.4. Redefining Reading through Technology

Traditional EFL reading has emphasized questions of comprehension, translation, and literal extraction [16]. While valuable for decoding, such practices can leave learners as passive recipients and limit opportunities to critically, creatively, or practically utilize ideas [17]. Contemporary literacy calls for a redesign, viewing reading as a generative process in which learners synthesize, evaluate, and transform textual knowledge into arguments, solutions, or multimodal expressions [18–21].

Technology enables this shift by expanding the expressive repertoire and social context of reading. The digital environment places reading in an interactive and participatory position, supporting multimodal composition, collaboration, and public knowledge sharing [22]. The redefined reading tasks include digital storytelling constructed from literary analysis, infographics synthesizing informational texts, collaborative interpretive blogging and curated portfolios, and publications connecting texts to real-world issues [23]. Such tasks involve higher-order

processes and deepening recall by requiring analysis, synthesis, and design [24], consistent with academic literacy that values specialized communication and rhetorical awareness [25]. They also strengthen learner autonomy and metacognition as students make deliberate expressions of choices and reflect on the process and objects [26].

Despite this potential, widespread implementation in EFL is limited by test-based curricula, uncertainty about evaluating creative products, and limited pedagogical guidance for redesign [27]. Learners may also need structured support frameworks, for example, clear criteria, phased outputs, and feedback loops to move from understanding to interpretation and production [28].

2.5. Recent Research Trends in Generative AI for EFL Reading

Recent research since 2023 indicates a rapid expansion of generative Artificial Intelligence (AI), particularly large language models such as ChatGPT, in language education and literacy instruction. Contemporary studies increasingly conceptualize generative AI as a cognitive support tool that facilitates comprehension, idea development, and higher-order thinking when embedded within pedagogically structured tasks rather than used for content automation [29–31]. This shift reflects a broader movement in the field from tool adoption toward pedagogical intentionality.

In English as a Foreign Language (EFL) contexts, recent experimental and classroom-based studies report positive effects of ChatGPT-assisted instruction on reading comprehension, strategic processing, and learner engagement. Experimental evidence shows that AI-supported reading can enhance learners' ability to clarify complex language, maintain reading flow, and monitor comprehension [32–34]. Learner perception studies further suggest that students view AI as a supportive learning companion that reduces anxiety and increases confidence, while simultaneously acknowledging the importance of ethical awareness and critical evaluation of AI-generated output [35].

At the same time, recent systematic reviews and meta-analyses urge caution against assuming automatic learning benefits. Syntheses of experimental research include that learning gains associated with generative AI are highly contingent on instructional design, task structure, and opportunities for reflection [36,37]. Without these conditions, AI use may result in superficial engagement, overreliance, or limited cognitive challenge. Broader multidisciplinary analyses also highlight concerns related to academic integrity, epistemic trust, and the uncritical acceptance of AI-generated content [30].

In response, recent scholarship and policy-oriented guidance emphasize the development of AI literacy and responsible use frameworks. International guidelines stress that generative AI should be integrated transparently and ethically, with explicit attention to verification, authorship, and learner agency [38]. Collectively, this body of work signals a shift from questioning whether AI can support learning toward examining how AI should be pedagogically positioned to promote meaningful knowledge construction.

Despite these advances, notable gaps persist. Most recent studies focus on outcome measures or learner attitudes rather than on the redesign of reading tasks themselves [36,37]. Few studies explicitly situate generative AI within transformative instructional models such as the Redefinition level of the SAMR framework, nor do they integrate Project-Based Learning and multimodal literacy as central organizing principles. This gap underscores the need for empirically grounded models that operationalize AI as a mediating cognitive tool supporting inquiry-driven, product-oriented, and ethically responsible EFL reading practices—an aim addressed by the present study.

2.6. Research Gap and Contribution

Although the SAMR model, socio-cultural theory, Project-Based Learning, and digital literacy frameworks collectively advocate for transformative uses of technology in language education, empirical research has rarely demonstrated how these perspectives can be operationalized in EFL reading at the Redefinition level. Existing SAMR-based studies in language education largely remain descriptive or tool-oriented, offering limited evidence of how Redefinition reshapes reading as a cognitive, inquiry-driven, and knowledge-generative process. Similarly, recent research on generative AI in EFL contexts has focused primarily on discrete skill development, learner perceptions, or short-term performance outcomes, with AI typically positioned as a support for summarization or language simplification rather than as a mediating cognitive tool for meaning construction. As a result, there is a lack of design-based, classroom-grounded research that demonstrates how AI can enable reading tasks that are otherwise unattainable within traditional pedagogy, particularly at the transitional level where learners move from comprehension-based reading toward academic and professional literacy. Addressing this gap, the present study operationalizes SAMR

Redefinition in EFL reading by integrating AI-mediated support within Project-Based Learning and digital literacy frameworks, and empirically examines its impact on learner engagement, depth of understanding, and transformative literacy practices.

3. Conceptual Framework

Building on the theoretical perspectives and research gaps identified above, this study adopts an integrated conceptual framework to explain how Artificial Intelligence (AI), when purposefully embedded at the Redefinition level of the SAMR model, can transform English as a Foreign Language (EFL) reading instruction. As shown in **Figure 1**, the framework synthesizes the SAMR model [1], socio-cultural mediation theory [3], Project-Based Learning (PBL) principles [8], and digital competence theory [15], positioning AI as a cognitive mediator that supports meaning construction rather than task automation [7,11,12].

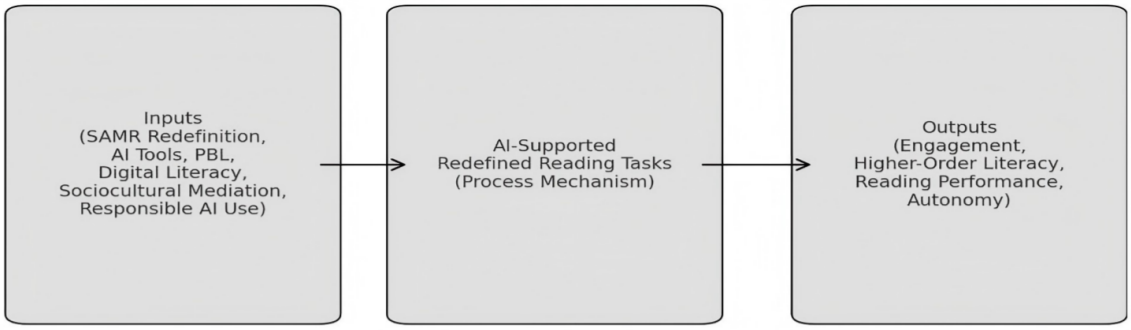

Figure 1. AI-Supported SAMR Redefinition Framework for Transformative EFL Reading.

As shown in **Figure 1**, at the center of the framework is the Redefinition level of SAMR, which emphasizes learning tasks that would be unattainable without digital technologies and are grounded in authentic, project-based inquiry and systematic instructional design [39–42]. Claims of transformation are further anchored through established frameworks for methodological rigor, validity, and evaluative reliability, ensuring that Redefinition is empirically substantiated rather than nominal [43,44]. In this study, AI-assisted reading tasks extend beyond comprehension by enabling multimodal interpretation, argument development, and knowledge transformation, aligning with contemporary views of literacy as a design-oriented and communicative process [9,22,24].

Guided by socio-cultural theory, AI functions as a mediating tool that supports learners' cognitive development through scaffolding, dialogue, and collaborative meaning-making [3]. Within this structure, Project-Based Learning (PBL) organizes reading around authentic, inquiry-driven outcomes such as infographics, podcasts, and research-based digital artifacts [8,35]. Digital literacy principles further inform the framework by emphasizing critical evaluation, multimodal expression, and ethical participation in knowledge construction [9,15].

4. Methodology

4.1. Research Design

This study uses a multi-method action research design to investigate student perceptions and engagement in AI-assisted redefined reading tasks in the context of English as a Foreign Language (EFL). Action research was chosen because it allows teachers to systematically investigate and improve their own classroom practices while collecting data from learners in authentic educational settings, and because such iterative, practice-based designs are recommended for examining pedagogical innovation and technology integration in real classrooms [36–38]. A convergent multi-method action design was used, incorporating both quantitative and qualitative data to provide a broader understanding of learning outcomes and learner experiences [39]. In this study, quantitative survey data help identify general trends, while qualitative interviews clarify the reasoning behind those patterns.

4.2. Participants

Participants were 130 undergraduate students studying English as a Foreign Language (EFL) enrolled in intermediate reading courses at a Vietnamese university during the second semester of the 2024 academic year. Their English proficiency ranges from CEFR B1 to B2 based on the university's placement tests. All 130 students completed the questionnaire. To supplement this, six students were purposefully selected for follow-up interviews to represent different learner profiles, including a high-achieving student, an average learner, a struggling learner, a skeptical learner, a high AI user, and a low AI user. Purposeful sampling ensures diversity in responses and depth in qualitative findings [40].

4.3. Research Instruments

4.3.1. Questionnaire

The primary tool for collecting quantitative data was a structured survey including 40 Likert scale items organized into five domains: Task design at the redefined level, AI integration, Engagement and motivation, Reading skill development, Responsible use of AI, and challenges. The questionnaire used a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) and included open-ended sections for comments. The content questionnaire was reviewed by two applied linguistics experts to ensure content validity. Internal reliability was confirmed by a Cronbach alpha coefficient of 0.89, indicating high reliability of the tool [41].

4.3.2. Semi-Structured Interview

Semistructured interviews were conducted to collect qualitative data. The interview protocol included nine open-ended questions, aligned with the three research questions. The interviews explored learners' experiences using AI, perceived benefits and challenges, and changes in engagement. Interviews lasted 10–15 min and were recorded with participants' consent. This tool allows for deeper exploration of attitudes and perceptions not captured by the questionnaire [42].

4.3.3. Procedure

The study lasted eight weeks and followed action research procedures, including planning, intervention, observation, and reflection [38]. During the intervention, traditional reading activities such as comprehension questions were redesigned into redefined reading tasks based on the AI-assisted SAMR Model [43]. Students completed two project-based reading tasks:

- Project 1: Read multiple texts and create a digital infographic for each text.
- Project 2: Create a podcast or digital story based on the reading analysis.
- Project 3: Complete an on-site project and report it as a research essay, documentary video, and Google website.

Students use ChatGPT as a reading aid to clarify difficult vocabulary, reinterpret complex texts, expand arguments, and brainstorm ideas. Project-based learning (PBL) promotes exploration and authentic learning tasks that connect theory and application [44].

4.3.4. Integrating Artificial Intelligence (AI) into Project-Based Learning (PBL) Tasks

To enhance methodological transparency and support reproducibility, this section details how Artificial Intelligence (AI) is applied in Project-Based Learning (PBL) tasks. AI, specifically a large language model (ChatGPT), is intentionally integrated as a cognitive support tool, not a content replacement mechanism. The use of AI is incorporated into all project phases in a structured pedagogical sequence: reading–interpreting–transforming–creating.

In the reading and interpreting phase, students use AI to clarify unfamiliar vocabulary, rephrase complex sentences, and request simplified explanations of difficult academic passages. To avoid passive dependence, students are required to cross-check AI-generated explanations against the original text and highlight differences in group discussions.

In the analysis and transformation phase, AI supports higher-order cognitive processes. Students ask AI to generate guiding questions, compare viewpoints across multiple texts, and map arguments or thematic relationships. For example, draft, learners use AI-generated outlines or argument diagrams as thinking tools, which are

then modified, expanded, or discarded based on evidence from the text and peer feedback.

In the product creation phase, AI assists students in designing multimedia products that align with project-based learning outcomes (PBL), including infographics, podcasts, digital stories, and research-based websites. AI is used to brainstorm presentation structure, refine language for clarity and coherence, and simulate audience questions. However, all final products require students to synthesize, cite source texts, and provide reflective justification for how AI input was adapted or modified.

To support the responsible use of AI, instructors provide specific guidelines, including: (a) documenting AI suggestions and outputs; (b) verifying AI-generated information against source texts; and (c) reflecting on the role of AI in the learning process. AI use is monitored through reflective logs, group tests, and product-based assessment criteria, emphasizing originality, critical evaluation, and multimodal coherence. Artificial intelligence is permitted solely to support the learning process, while assessment focuses only on student-generated results.

4.4. Data Collection

Data collection took place in two phases:

- Phase 1: All 130 students completed the questionnaire via Google Forms in week 7.
- Phase 2: Six students were interviewed in week 8 to gain a deeper understanding of their responses.

4.5. Data Analysis

Quantitative data from the survey were analyzed using descriptive statistics (mean, percentage, and standard deviation) to identify trends in learners' perceptions. Qualitative data were analyzed using topic analysis in Braun and Clarke's six-step framework [45]. Topics were identified, coded, and refined, and triangulation was used to increase the reliability of interpretation [46].

4.6. Ethical Considerations

Ethical consent was obtained from the host institution. Participation was voluntary and anonymous. Informed consent was obtained prior to data collection, and students were assured that their learning outcomes would not be affected by participation. Data were stored securely and used only for research purposes in accordance with ethical research guidelines [47].

5. Findings

5.1. Findings for Research Question 1

5.1.1. Quantitative Findings of RQ1

As shown in **Table 1**, students reported high agreement that AI-assisted reading tasks promoted higher-order thinking and knowledge transformation. Descriptive statistical analysis revealed a high level of consensus among participants that AI-assisted reading tasks differed significantly from conventional reading methods. Items in the area of Redefining Level-Level Task Design scored high averages, indicating that students perceive these tasks as transformative rather than supplementary. For example, participants positively rated statements such as "AI-based reading tasks helped me create novel learning products that went beyond comprehension" (M = 4.32, SD = 0.71) and "These tasks required higher-order thinking such as analysis and synthesis" (M = 4.21, SD = 0.69). Overall, 87% of respondents agreed or strongly agreed that AI integration expanded task complexity by going beyond testing comprehension to synthesizing and applying textual information.

Table 1. Perceptions of SAMR Redefinition-Level Reading Tasks.

Item (Domain: Redefinition-Level Task Design)	Mean	SD
AI-based reading tasks helped me create new learning products beyond comprehension.	4.32	0.71
These tasks required higher-order thinking such as analysis and synthesis.	4.21	0.69
The reading lessons moved from answering questions to real-world application.	4.18	0.75

These findings suggest that the intervention successfully completed learning tasks consistent with the Rede-

finance level of the SAMR model, where technology enables learning activities that would not be feasible through traditional pedagogy. This is conceptually consistent with the framework [43] that redefines learning as promoting task innovation and authentic knowledge construction.

5.1.2. Qualitative Findings of RQ1

Data from semi-structured interviews reinforced the survey results by illustrating specific ways in which AI contributed to the redesign of reading tasks. Participants highlight the shift from passively receiving text to actively transforming knowledge. One student described the difference as follows: "I not only understood the text but also transformed it into a new product for a real audience." (Participant 1). Similarly, another participant highlighted the integration of creativity and multimodal output: "Instead of just reading and answering questions, we used AI to build podcast scripts after comparing sources." (Participant 2)

Even learners considered to be of lower proficiency reported meaningful engagement in tasks requiring higher cognitive skills: "Previously, I always translated, but now I have to explain ideas in my own words to create a poster." (Participant 3)

These narratives align with constructivist principles, demonstrating that AI acts as a cognitive scaffold supporting students in creating original, audience-oriented reading products such as infographics, podcasts, and digital narratives-activities consistent with higher-order literacy practices.

Convergent analysis revealed that AI-assisted redefined tasks significantly altered students' reading experiences by shifting the teaching focus from comprehension to production, from individual recall to collaborative interpretation, and from classroom exercises to the creation of genuine meaning. These findings confirm that teaching design has moved beyond task enhancement toward task transformation, thereby leveraging learning at the redefined level as theorized within the SAMR framework.

5.2. Findings for Research Question 2

5.2.1. Quantitative Findings of RQ2

As shown in **Table 2**, the overall mean score for this domain is M = 4.12, indicating strong agreement with positive statements regarding the use of AI. The highest-rated items are students' high appreciation of AI as a learning aid that improves reflective idea development and reading confidence. For example, students strongly agreed that "AI tools have improved the quality of my reading assignments" (M = 4.56) and "AI has helped me expand my ideas in reading-based projects" (M = 4.54, see the following tables).

Table 2. Perception of AI in Reading.

No.	Survey Item (Perception of AI in Reading)	Mean	SD
1	AI tools improved the quality of my reading assignments.	4.56	0.62
2	I always reviewed AI-generated responses before using them.	4.55	0.64
3	AI helped me expand my ideas during reading-based projects.	4.54	0.66
4	AI-supported reading tasks increased my confidence in understanding texts.	4.46	0.71
5	AI helped me clarify difficult vocabulary and complex academic language.	4.47	0.68
6	AI made reading assignments more interesting and engaging.	4.32	0.75
7	AI helped me continue reading when I got stuck on difficult parts.	4.28	0.77
8	AI supported my understanding but did not replace my thinking.	4.45	0.73
9	AI reduced stress and frustration during reading tasks.	4.31	0.79
10	AI helped me study independently without relying too much on the teacher.	4.15	0.82
11	I felt motivated to complete reading projects that used AI.	4.10	0.80
12	AI tools made it easier to generate and organize ideas.	4.38	0.74
13	I trusted AI suggestions when doing reading tasks.	4.02	0.88
14	AI made reading tasks more efficient and saved me time.	4.35	0.71
15	I enjoyed reading more when AI was used in the lessons.	4.12	0.83
16	I became dependent on AI tools when reading. *(Reverse item)*	3.31	1.02
17	I sometimes relied too much on AI instead of thinking independently. *(Reverse item)*	3.18	1.05
—	Overall Mean RQ2 Domain Score	4.12	—

Table 2 illustrates that the cognitive scores are consistent with those recorded in the Redefining Task and Engagement domains, suggesting that AI is not perceived as disruptive but rather as having pedagogical value. These positive perceptions reflect previous statements that the use of technology in language learning increases when learners see clear functional benefits and reduced cognitive barriers [6,11].

5.2.2. Qualitative Findings of RQ2

Interview data confirmed the quantitative findings and revealed three key cognitive themes: perceived usefulness, increased motivation, and critical awareness of AI limitations.

Participants reported that AI Participants reduced frustration during reading and increased willingness to engage with complex texts: "Reading became less stressful because I could ask the AI questions when I got stuck." (Participant 3). This is consistent with findings showing that technology-enhanced tasks improve learner engagement because they provide immediate feedback and mental support during challenging tasks [5,6]. While attitudes toward AI were positive, students also demonstrated awareness of potential risks, such as inaccuracy and over-reliance: "Sometimes AI gives wrong or generic answers, so I have to verify the information." (Participant 4), "At first, I was too reliant on AI, but I learned to think for myself." (Participant 3). This finding reflects recent concerns in the context of AI-integrated learning, where passive use and academic reliance need to be prevented [11,12].

Overall, students perceive AI as a beneficial learning assistant, improving comprehension, productivity, and confidence in reading tasks. Simultaneously, interviews reveal a shift toward responsible AI use, showing that learners are not blindly dependent but strive to validate and refine AI-generated output. These findings support learner principles [10] and constructivist orientation, in which learners actively evaluate and interact with knowledge sources [3].

More importantly, positive perceptions can also be attributed to the purposeful design of AI-assisted reading tasks within the SAMR Redefinance framework. When AI use aligns with meaningful learning objectives, it supports deeper engagement rather than superficial tool use [34]. This shows that pedagogical design, not just AI, shapes students' perceptions, reinforcing the argument that teaching intent is essential in a technology-enhanced learning environment [6].

5.3. Findings for Research Question 3

5.3.1. Quantitative Findings of RQ3

To measure the relationship between AI use and student engagement in reading tasks, two composite indices were constructed from survey results. The AI-Assisted Integration and Support Index (AISI) was created from items in the cognitive domain measuring the frequency and extent of AI use in reading tasks, while the Engagement and Performance Index (EPI) incorporates items related to reading engagement, improved comprehension, and confidence. These indices provide a clearer picture of how AI impacts student learning rather than using only individual survey items.

As shown in **Table 3**, the data indicate high levels of AI use and engagement in the classroom. The average AISI score was fairly high, suggesting that most students used AI tools regularly and meaningfully, while the average EPI score showed that students reported high levels of engagement and improved reading performance in AI-assisted reading projects. Both indicators show acceptable internal consistency based on Cronbach's alpha coefficients, supporting their use as aggregate measures [41].

Table 3. Reliability and Composite Statistics for AISI and EPI.

Index	Number of Items	Mean	SD	Cronbach's α	N (Valid)
AISI (AI-Support and Integration Index)	36	4.12	0.64	0.89	130
EPI (Engagement and Performance Index)	14	4.24	0.58	0.87	130

Note: AISI = composite index measuring frequency and depth of AI use in reading tasks; EPI = composite index measuring student engagement and reading performance. Both indices were measured using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Importantly, a relatively strong positive correlation was found between AISI and EPI ($r = 0.62$), suggesting that students who used AI more extensively reported higher levels of engagement, better comprehension, and stronger reading confidence (see **Table 4**). A simple linear regression confirms that AI use significantly predicts engagement and performance, meaning that AI use contributes positively to learning outcomes rather than being a distraction. These findings support the claim that technology can enhance student engagement when it is meaningfully integrated into learning rather than being used as a replacement for traditional assignments [5,6].

Table 4. Association between AI Integration (AISI) and Engagement/Performance (EPI).

Statistic	Value	Interpretation
Pearson correlation (r)	0.62	Moderately strong positive association
95% Confidence Interval	0.51 to 0.72	Association is statistically reliable
Regression slope (β_1)	0.57	Engagement increases as AI use increases
Intercept (β_0)	1.48	Baseline engagement without AI influence
R^2 (Coefficient of determination)	0.38	AI use explains 38% of engagement variance
N (valid cases)	130	Sufficient sample size

5.3.2. Qualitative Findings of RQ3

Interview data shed light on how AI-assisted redefined tasks fostered stronger engagement and improved reading comprehension performance. Overall, participants described AI as an intermediary tool that eased barriers to understanding, structured the idea development process, and promoted richer engagement in collaborative work. Three closely related themes stood out:

(a) engagement and confidence in learning,
(b) support for understanding and strategic reading,
(c) higher-order thinking and collaborative knowledge building.

Participation and Learning Confidence

Across multiple groups (including those with difficulties and those with limited AI use), students reported that AI helped them prepare contributions before class, reducing anxiety and encouraging them to speak up in group activities. Those who were typically quieter reported being able to participate in discussions after using AI to practice key points or organize speech notes. This preparation effect leads to more consistent participation in project meetings and presentations. This pattern aligns with the expectation that assistive tools can facilitate participation in discussion communities, thereby bolstering learning confidence [3], and is consistent with project-based designs that value public participation [8].

Comprehension Support and Strategic Reading

Students frequently reported that AI's explanations, reinterpretations, and vocabulary clarifications allow them to maintain reading flow rather than getting stuck on difficult sections. Learners described a shift from cumbersome translation processes to strategically using AI to clarify objectives, check summaries, and quickly familiarize themselves with terminology. Some participants also noted that the AI's step-by-step simplification made dense academic prose more understandable, thus increasing work time and reducing frustration. This reallocation of effort—from decoding to generating meaning—showed lower cognitive load at difficult points and is consistent with research showing that well-integrated technology can facilitate strategic use and monitoring of intelligence [5,6].

Higher-Order Thinking and Collaborative Knowledge Building

Beyond comprehension, students describe AI as a tool to aid analysis and synthesis. Learners often use AI to compare viewpoints across texts, map arguments, or generate counterarguments to test the solidity of their positions before group debates or design tasks. In some groups, AI output acts as impromptu drafts, outlines, discussion points, or topic clusters, which groups later critique, reorganize, and supplement with textual evidence. The iterative interaction between AI suggestions and human judgment supports the transition from surface understanding to multimodal reasoning, evaluation, and composition (e.g., podcasts, infographics). Such activity reflects a shift toward a Redefinition level in the SAMR model, where technology enables the execution of tasks and products that are difficult to achieve through traditional processes [34], and is pedagogically consistent with project-based learning that emphasizes authentic products and collaborative knowledge building [8].

Responsible Use: Calibration and Verification

Despite positive attitudes, participants also described developing defenses against over-reliance. Many reported cross-checking AI proposals against source text, encouraging alternative perspectives, and modifying language to preserve their own voice. Students who initially accepted results without critique indicated they subsequently applied verification processes (e.g., evidence tracing, bias checking) as part of the norms group. This emerging AI-based understanding -using the tool as a framework rather than a replacement is consistent with recommendations that technology should complement, not replace, learner cognition [5,6].

In summary, the interviews show that AI supports a path from accessibility to actionability: easing intelligence bottlenecks, enabling planned participation, and catalyzing higher-order literacy activities in collaborative projects. These processes are consistent with socio-cultural mediating accounts of learning [3] and with project-based pedagogy toward authentic, public-oriented products [8]. When placed in tasks at the redefining level, AI acts less as a response tool and more as a design partner that students have learned to calibrate and verify, thus maintaining engagement and improving performance in ways that complement the quantitative models reported [43].

5.4. Interpretation of Findings for RQ3

The combined quantitative and qualitative findings indicate that AI-assisted redefined reading tasks had a positive and significant impact on student engagement and reading performance. Quantitative analysis revealed a fairly strong positive correlation (r = 0.62) between AI usage levels (AISI) and engagement/performance outcomes (EPI), suggesting that students who used AI more effectively were also more actively engaged in reading tasks and achieved better reading results (**Table 4**). This statistical model is further supported by qualitative evidence, showing that students strategically use AI to solve problems, maintain task progress, and participate in project discussions with greater confidence.

Overall, these findings suggest that AI acts not only as a convenient tool but also as a cognitive and metacognitive framework supporting reading persistence, modulating comprehension, and collaborative reasoning abilities. This reflects core principles of sociocultural theory, in which learning is mediated by tools that enhance cognitive engagement in the learner's Zone of Proximal Development [3]. In this study, AI served as such a mediating tool by enabling students to access complex texts that they might otherwise avoid due to difficulty.

Furthermore, the results show that AI became most useful when integrated into the structure of Project-Based Learning (PBL). Practical reading projects (e.g., podcasts, infographics, discussions) require students to apply reading to productive and transformative tasks, which shifts their focus from simple decoding to meaningful knowledge construction. This is consistent with previous research highlighting the role of purposeful task design in maintaining motivation and engagement [8].

Most importantly, the interaction between AI use and task design in this study reflects the extent to which the SAMR framework is being refactored [43]. The technology was not used to digitize traditional assignments but to enable previously unimaginable literacy activities, including multimodal synthesis, argument restructuring, simulated debate, and collaborative text design. These are literacy behaviors related to advanced academic reading and critical literacy, suggesting that AI can facilitate higher-order reading development when intentionally integrated.

Finally, the interviews reveal a pattern of responsible AI development: students moved from dependence to critical use, validating AI suggestions and integrating them with textual evidence. This progression demonstrates the emerging AI literacy capability, which is essential to ensure that AI enhances, rather than replaces, learning [6].

In summary, AI-assisted redefined reading tasks enhanced engagement, improved reading performance, and supported deeper literacy development by incorporating three key conditions: (1) structured AI integration, (2) authentic task design, and (3) collaborative reasoning structure. These findings demonstrate the effectiveness of AI-assisted redesign of reading instruction when it is based on transformative learning design rather than mere tool replacement.

6. Discussion

6.1. Transformation Beyond Digital Enhancement: Evidence of Redefinition (RQ1)

The first research question examines the differences between AI-assisted reading tasks and traditional reading instruction methods. The results provide strong evidence that the intervention reached the Redefining stage of the SAMR model, where technology enables the performance of learning tasks that would otherwise be impossible [1,4,44]. Consistent with previous critiques of traditional reading pedagogy [2,16], the redesigned tasks in this study went beyond testing comprehension, translation, and recall toward constructing authentic knowledge.

Quantitative results (**Table 1**) show a high level of consensus among students that AI-based tasks produce unique outcomes beyond comprehension (M = 4.32) and stimulate higher-order thinking such as synthesis and analysis (M = 4.21). These learning outcomes reflect the knowledge transformation direction of Redefinition, emphasizing generative rather than copyive learning [4]. Qualitative evidence supports these outcomes, showing

that students generate AI-powered digital products such as podcasts, infographics, topic catalogs, and analytical summaries—products unattainable in traditional teacher-led reading activities. These outcomes are consistent with the process component of the conceptual framework (**Figure 1**), explaining how AI enables the redesign of learning pathways leading to the generation and production of meaning.

The shift from comprehension-focused reading to multimodal, audience-oriented knowledge production reflects a critical literacy orientation that emphasizes learner agency and dialogic meaning-making [20]. This transformation is further aligned with digital storytelling research, which highlights reflective narrative design and audience awareness as key drivers of engagement and learning [23], and it supports an agentic view of learning in which students actively regulate and shape their cognitive engagement throughout the reading process [26].

These findings align with recent experimental studies and empirical models showing that AI-supported tasks can foster higher-order thinking and multimodal knowledge production when instructional design advances beyond comprehension toward task transformation [29–33]. Evidence from EFL contexts further indicates that such gains are contingent on structured inquiry, learner agency, and authentic, product-oriented outcomes, rather than on AI use in isolation, a pattern reinforced by large-scale reviews and meta-analytic findings [34–36].

6.2. SAMR as a Diagnostic Lens: Redefinition Reflected in Learner Perception (RQ2)

The second research question explores students' perceptions of AI-assisted redefined reading tasks. The overall mean cognitive score (M = 4.12) shows strong acceptance of AI as a constructive learning tool. Importantly, students view AI not as a shortcut but as a learning scaffold that improves their comprehension, ideation, and engagement with the task. This aligns with the SAMR model, in which the use of technology at a higher level restructures the purpose of the task and learning activities [1,5].

Learners stress that AI helps them reinterpret the text, explore multiple perspectives, and reshape arguments, which confirms Romrell et al.'s statement that Redefinition requires technology to support new intellectual behaviors [4]. These insights also confirm the mediating role of AI within conceptual frameworks, consistent with Vygotsky's socio-cultural theory [3], in which AI acts as a cognitive partner, supporting exploration and co-construction rather than replacing student thinking. This finding strengthens the growing argument in AI in education research that generative AI can enhance autonomy and critical thinking when properly supported [11,12].

Such perceptions align with evidence that students value AI as a learning scaffold when its use is pedagogically structured [29,30], enacted through guided, transformative classroom tasks [31–34], and supported by learner-experience studies and synthesis evidence [35,36].

6.3. SAMR-Redefinition as a Driver of Engagement and Performance (RQ3)

The third research question examines how redefined reading tasks affect student engagement and reading performance. The results show a relatively strong positive association (r = 0.62) between AI-assisted task design and student engagement/performance outcomes (**Table 4**). This supports the claim that learning at the Redefined level increases motivation by connecting reading to meaningful output and a public audience [1,43].

Students reported that reading became more purposeful when linked to knowledge creation rather than answer creation. This is consistent with the higher levels of the modified Bloom classification—applied, analytical, synthetic, and creative [21]—and supports the output component of the conceptual framework. Students also reported increased engagement and confidence, reinforcing socio-cultural claims that learning is improved through mediated collaboration and cognitive support [3]. These results suggest that the transformation in reading instruction comes not only from AI but also from redesigned pedagogy using AI as a mediating tool, fitting the framework.

These findings align with evidence that generative AI enhances engagement and performance when embedded in structured, design-driven tasks rather than used for surface-level assistance [29,30], enacted through higher-order, agentive learning activities [31–34], and confirmed by learner-focused and synthesis research [35,36].

6.4. Instructional Shifts Observed

As summarized in **Table 5**, the implementation of AI-assisted SAMR Redefinition results in a clear instructional shift from traditional EFL reading practices to learner-designed, knowledge-transformative pedagogy. These changes reflect a shift from teacher-centered reading pedagogy to learner-designed reading pedagogy. They are consistent with the SAMR transformation principles [4] and Reinking & Bradley's view of reading as a semiotic de-

sign [22]. The teacher's role has shifted from information provider to learning architect, consistent with the PBL principles [8] and the digital competency framework [15].

Table 5. Instructional Shift from Traditional to AI-Redefined EFL Reading Practices.

Instructional Dimension	Traditional EFL Reading	Redefined AI-Supported Reading
Learning Purpose	Recall & comprehension	Knowledge transformation
Task Output	Answers & summaries	Authentic digital products
Student Role	Information receiver	Knowledge designer

6.5. Challenges in Redefinition-Level Implementation

Despite the positive results, three challenges remain:

(1) High cognitive demands require support to prevent the creation of superficial products [5],
(2) Assessment limitations make it difficult to assess multimodal literacy using traditional assessment criteria,
(3) The risk of AI misuse requires serious guidance on use and verification [11,12].

These challenges reinforce Hamilton's caution that SAMR should not be considered a technology overlay but a pedagogical redesign requiring deliberate support [1].

These challenges mirror broader evidence that effective generative AI integration requires explicit pedagogical scaffolding and ethical guidance rather than unregulated adoption [29,30], careful task and assessment design to prevent superficial learning [31–34], and governance frameworks that address misuse and accountability [35,36].

6.6. Contribution to SAMR-Based Pedagogy in EFL

This study contributes to SAMR scholarship in three ways:

(1) Provides empirical validation of Redefining-level task design in reading English as a foreign language [2].
(2) Extends SAMR beyond tool classification into a cognitive transformation model.
(3) Provides a scalable classroom framework integrating AI, PBL, and digital literacy.

These contributions are consistent with emerging AI literacy research and position this study within innovation-focused pedagogy.

6.7. Summary

This chapter demonstrates that AI-assisted reading tasks transform the literacy learning process by achieving a Redefinition of SAMR. The findings validate the theoretical framework by asserting that AI, when integrated into PBL and socio-cultural mediation, enables meaningful redesign of the reading process, not just surface enhancement. Overall, this research promotes innovation in English as a Foreign Language (EFL) reading by showing that literacy development is enhanced when teaching shifts from comprehension to knowledge design and multimodal composition.

7. Conclusions

7.1. Key Findings

The results show that AI-redefined reading tasks triggered pedagogical transformation across cognitive, behavioral, and emotional aspects of learning. In response to research question 1 (RQ1), students reported that reading tasks required higher-order thinking, synthesis, and practical application- clear evidence of SAMR Redefinition, in which technology enables the performance of previously unimaginable learning tasks [1,43]. For research question 2 (RQ2), learners perceive AI as a cognitive framework that enhances autonomy, motivation, and confidence without replacing independent thinking. In research question 3 (RQ3), the results showed a fairly strong positive correlation ($r = 0.62$) between AI integration and engagement/performance, suggesting that the redefined tasks not only maintained deeper reading outcomes but also supported improved reading outcomes. Overall, these findings confirm the AI-powered SAMR refinancing model proposed in this study and affirm that transformation occurs when AI is integrated into well-designed learning frameworks rather than being used superficially.

7.2. Theoretical Contributions

This study contributes to theory in three important ways. First, it advances SAMR scholarship by demonstrating how Redefining can be operated in EFL teaching—an area where empirical implementation remains scarce [2]. Second, by considering AI as a cognitive mediator consistent with Vygotsky's socio-cultural theory [3], this study reconceptualizes AI not as an external automation tool but as a partner in mediating meaning. Third, it extends multimedia theory and digital literacy by providing evidence that AI-assisted pedagogy promotes multimedia compilation and cognitive competence, asserting that reading in the digital age is a knowledge design process rather than text decoding [15,22].

Empirical evidence shows that AI in language education can act as a sociocultural mediator that scaffolds learning, aligns with Zones of Proximal Development, and supports transformative language tasks rather than mere automation [48]. Studies of GenAI literacy highlight cognitive, evaluative, and ethical competencies needed in redesigning pedagogy [49]. Recent research also finds that AI-supported digital multimodal composing enhances multiliteracies and deeper engagement, validating a shift from decoding to knowledge design in reading [50,51]. AI-enhanced learning influences learner self-efficacy and mindset, reinforcing cognition perspectives additionally [52].

7.3. Pedagogical Implications

The findings highlight that meaningful AI integration requires a deliberate redesign of pedagogical methods, not merely a digital replacement. Teaching English as a Foreign Language (EFL) reading comprehension should shift from knowledge-based processes to a production-oriented knowledge-based approach, emphasizing transformation and application. Teachers also need to develop AI knowledge frameworks to teach the responsible use of AI, including verifying AI-generated outcomes and raising ethical awareness. Curriculum designers should adopt process-based assessments that value creativity, synthesis, and multimodal communication, while institutions must support teacher competency development in AI-enhanced teaching design based on theoretical frameworks such as SAMR.

Recent systematic reviews confirm that meaningful AI integration in language education depends on pedagogical redesign rather than substitution, with AI supporting higher-order engagement, strategic use, and knowledge construction [53–55]. Evidence further indicates that AI reshapes reading and literacy practices toward synthesis, evaluation, and transformation, supporting a production-oriented approach to EFL reading comprehension [56]. Research also highlights the urgent need for AI literacy frameworks emphasizing ethical awareness and verification of AI outputs [54]. Finally, studies stress process-based, multimodal assessment and sustained institutional support for teacher competency development to enable effective AI-enhanced instructional design [55–57].

7.4. Limitations and Recommendations

While this study offers valuable insights, it is limited by several factors. The sample size was limited to 130 university students in Vietnam, which restricts generalizability. The eight-week intervention only measured short-term outcomes; long-term research is needed to examine long-term literacy skill development. The data relies in part on students' self-assessment reports, which may lead to bias. Future research should explore cross-cultural comparisons, teachers' perspectives on AI integration, and the development of validated assessment tools to evaluate reading outcomes at the conversion level. Further studies could also examine how AI literacy training shapes the responsible and critical use of AI in academic reading.

7.5. Novel Contributions

This study makes a significant and unique contribution to three intersecting fields: EFL pedagogy, AI in education, and technology integration theory. While SAMR has been widely cited over the past decade, it has been repeatedly criticized for its lack of empirical basis and theoretical clarity [1,2]. Most previous studies have only addressed SAMR as a classification of tool use rather than a framework for cognitive transformation. This study overcomes that limitation by operating Redefining as a measurable pedagogical process, providing empirical validation of transformation through AI-assisted reading design. In doing so, it responds to Hamilton et al.'s call to reposition SAMR "from tool ranking to task redesign" [1].

Furthermore, this study introduces an expanded theorized version of SAMR by embedding AI as an interme-

diary layer based on Vygotsky's socio-cultural theory [3], transforming SAMR from a static model into a dynamic framework of cognitive scaffolding. This reconceptualization challenges the assumption that SAMR ultimately becomes technology-enhanced output production. Instead, it provides evidence that AI can act as a cognitive partner supporting idea generation, conceptual conflict resolution, and knowledge transformation, promoting both AI literacy research and learning science [11,12].

Unlike previous studies on AI in reading that focus on tools at the replacement level, such as translation apps, grammar checkers, or electronic text readers [5,27], this study demonstrates AI-assisted literacy production using true generative transformation. The read-interpret-convert-create model introduced here is the first structured AI-SAMR pedagogical sequence in English reading as a foreign language. This framework provides reproducible classroom processes, aligning AI use with PBL learning cycles and multimodal literacy development, while maintaining academic integrity and human autonomy-a crucial response to global concerns surrounding the misuse of AI in education.

By integrating AI, SAMR, PBL, and digital literacy into a coherent pedagogical model, this research contributes a new research direction: AI-assisted transforming literacy. This shifts the field from tool application to knowledge innovation, making the model not only replicable but also scalable across a wide range of skills, domains, and learning contexts.

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Informed Consent Statement

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Data Availability Statement

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Conflicts of Interest

The author declares no conflict of interest.

AI Use Statement

The author used ChatGPT 5.2 solely for grammar checking, sentence structure refinement, and improving the readability of the English text in this manuscript. The author takes full responsibility for all academic content, including all ideas, data, analyses, and conclusions presented herein. The use of AI was thoroughly reviewed and supervised by the author.

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