

Calibrating AI Assistance in EFL Reading: The Graduated AI-Mediated Reading Support Framework

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Received: September 5, 2026 Accepted: September 20, 2026 Published: September 23, 2026

doi:10.5296/ijele.v14i2.24050 URL: <https://doi.org/10.5296/ijele.v14i2.24050>

Abstract

Generative artificial intelligence (GenAI) is increasingly being used to support second and foreign language reading through vocabulary explanation, simplification, summarization, background-knowledge provision, question generation, and feedback. These capabilities can simultaneously improve access to challenging texts and support reading development or substitute for the cognitive processes underlying independent reading competence. This article develops the Graduated AI-Mediated Reading Support (GAIRS) framework to address this tension in EFL reading. Drawing on research on reading cognition, instructional scaffolding, productive difficulty, cognitive offloading, learner autonomy, and GenAI-mediated learning, GAIRS distinguishes assistance that reduces barriers while preserving learner cognitive responsibility from assistance that performs interpretive, inferential, integrative, or metacognitive work for the learner. Three dimensions anchor the framework: contingency (when help is given), directiveness (how much cognitive work the support performs), and fading (how responsibility progressively shifts back to the learner). These dimensions inform four graduated configurations: independent attempt, responsive prompt, targeted explanation, and collaborative interpretation. GAIRS shifts the focus from the amount of assistance to how it sustains access while progressively expanding cognitive responsibility.

Keywords: generative artificial intelligence; EFL reading; scaffolding; cognitive responsibility; learner autonomy; AI literacy; reading comprehension

1. Introduction

Reading in a second or foreign language is a cognitively complex process in which linguistic knowledge, background knowledge, inferential reasoning, strategic activity, and metacognitive regulation interact to construct meaning. When readers encounter unfamiliar vocabulary, syntactically demanding structures, or implicit relations among ideas, comprehension requires more than processing linguistic information; readers must infer, integrate, evaluate, monitor, and revise interpretations. Digital technologies have long mediated these processes through electronic glosses, online dictionaries, and machine translation. Generative artificial intelligence (GenAI), however, expands such assistance through adaptive, conversational interactions around a text, including lexical and syntactic explanation, contextual knowledge provision, summarization, question generation, and interpretation. Emerging research indicates that these affordances may enhance EFL learners' reading comprehension, engagement, motivation, and self-regulated learning (Pan et al., 2025; Sagita et al., 2025; Thongsan & Anderson, 2025).

The pedagogical significance of GenAI lies not in the breadth of its affordances but in how it may alter the relationship between assistance and learning. Earlier reading technologies generally addressed discrete barriers, such as lexical meaning or translation, whereas GenAI can intervene across multiple levels of comprehension within a single interaction, generating interpretations and connections learners might otherwise construct themselves. A learner may therefore arrive at an accurate interpretation because GenAI has supplied an explanation without the learner engaging in the inferential, integrative, and metacognitive activity through which independent comprehension develops. This creates an accessibility–cognitive engagement paradox: GenAI can reduce linguistic and conceptual barriers sufficiently to make challenging texts accessible, particularly in EFL contexts where limited lexical repertoires, syntactic knowledge, or background knowledge constrain access to authentic texts. But reducing barriers does not necessarily develop the cognitive processes required for independent reading. Recent scholarship has consequently raised concerns about cognitive offloading and illusory mastery (Harris, 2026; Sony & Mus, 2026; Fayize, 2026).

The pedagogical value of assistance cannot be determined solely by whether it enables learners to reach a correct interpretation. It must also be considered in relation to the cognitive activity it enables, supports, substitutes for, or renders unnecessary. This tension makes GenAI's pedagogical role fundamentally a question of calibration rather than access. Insufficient assistance may leave learners unable to access a text or force them to devote disproportionate cognitive resources to linguistic obstacles rather than meaning construction. Excessive or overly direct assistance, by contrast, may displace the inferential, integrative, evaluative, and monitoring processes through which reading competence develops. The central challenge is therefore determining what assistance to provide, when, how directly, and when to reduce or transform it.

Emerging scholarship has examined GenAI-supported scaffolding, metacognition, and cognitive offloading, yet these perspectives remain fragmented, without a principled account of how AI assistance should be calibrated for EFL reading. Such an account requires

distinguishing support that expands learners' capacity for productive reading processes from support that substitutes for those processes or merely facilitates task completion.

This article develops the Graduated AI-Mediated Reading Support (GAIRS) framework, a conceptual model for calibrating generative AI assistance in EFL reading. Drawing on reading cognition and instructional scaffolding, GAIRS conceptualizes GenAI-mediated support through three governing dimensions, contingency, directiveness, and fading, and proposes four graduated learner–GenAI interaction configurations. Its central objective is to explain how GenAI assistance can increase access to challenging texts while preserving and progressively transferring the cognitive responsibility essential for independent reading competence.

2. EFL Reading as a Cognitive Process

Reading is an active process of constructing and monitoring meaning through linguistic knowledge, prior knowledge, inferencing, and strategic processing (Grabe & Stoller, 2020). L2 readers often expend cognitive resources on lower-level linguistic processing that proficient readers can instead devote to meaning construction (Koda, 2005). GenAI can support this process at several points, but its pedagogical value depends not on the function it performs but on how much cognitive work it leaves to the learner.

Five dimensions are central: comprehension, inferencing, vocabulary processing, background-knowledge activation, and metacognitive regulation. At each, GenAI may either reduce barriers to engagement or displace the cognitive work reading requires, functioning as scaffolding or substitution depending on its contingency, directiveness, and whether it progressively returns responsibility to the learner.

Recent studies support both readings. GenAI can reduce unnecessary cognitive burden and deepen processing, though uncritical use risks superficial engagement (Li & Alias, 2025). Structured ChatGPT integration in B1-level EFL reading improved comprehension and autonomy when embedded across pre-, while-, and post-reading stages with explicit GenAI literacy instruction (Ironsi & Bostanci, 2026). GenAI can also support attention, memory, and metacognitive regulation through adaptive feedback (Bezugla & Savytska, 2025), and has been linked to gains in reading proficiency and autonomy, alongside concerns about overreliance and contextual sensitivity (Maryansyah et al., 2025).

2.1 Comprehension

Comprehension integrates lower-level processes (word recognition, syntactic parsing) with higher-level construction of coherent meaning (Kintsch, 1998; Grabe & Stoller, 2020); L2 readers' greater working-memory demands at the lower level can limit resources for the latter (Koda, 2005). GenAI supports comprehension by reducing linguistic barriers such as unfamiliar vocabulary or complex syntax, but becomes substitutive when it supplies an interpretation learners could construct themselves. Excessive dependence on GenAI-generated answers has been linked to avoidance of lengthy texts and reduced productive struggle (Hidayati et al., 2026). Assistance given after a learner's attempt tends to support reflection;

assistance given before it tends to remove engagement.

2.2 Inferencing

Skilled readers continually infer beyond the explicit text—resolving references, drawing on context, and connecting ideas (Cain & Oakhill, 1999; Koda, 2005). GenAI poses a particular substitution risk by generating plausible inferences rapidly, so that asking it to identify a referent or implied meaning can bypass inferential practice. It better supports inferencing when learners first propose an interpretation and use GenAI to evaluate their reasoning or consider alternatives, preserving agency (Min Jou & Yungwei Hao, 2026). Conversational GenAI has been shown to support inference-making and critical evaluation, with stronger benefits for higher-proficiency readers (Hsu et al., 2026).

2.3 Vocabulary Processing

Vocabulary knowledge is closely tied to comprehension and develops through repeated meaningful encounters (Nation, 2001, 2013). GenAI can rapidly supply definitions, examples, translations, and contextual distinctions, and can support adaptive vocabulary practice, though it should supplement, not replace, principled instruction (Mostafa, 2026). However, immediate definitions may not replicate the learning conditions of active engagement, which involves noticing a lexical gap, hypothesizing meaning from context, and confirming or revising it (Laufer & Hulstijn, 2001). GenAI has greater scaffolding value when introduced after learners attempt inference, confirming or challenging rather than replacing that effort. GenAI-assisted vocabulary engagement has been linked to lexical retention and comprehension, though this varies with working-memory capacity (Jin & Luo, 2026).

2.4 Background-Knowledge Activation

Prior knowledge of topic, genre, and cultural context shapes text interpretation (Anderson & Pearson, 1984; Koda, 2005); cultural familiarity measurably affects ESL comprehension (Johnson, 1982). EFL readers may face compounded difficulty when linguistic unfamiliarity coincides with limited background knowledge. GenAI can support schema activation through personalized, multimodal scaffolding (Ouafaa & Abdelmajid, 2025), and integrating GenAI with established reading theories can support personalized scaffolding across reading stages without replacing teacher expertise (Masri & Masri, 2026). It functions as an enabling scaffold when supplying missing knowledge but becomes problematic when it performs the interpretation that knowledge is meant to support.

2.5 Metacognitive Regulation

Skilled readers monitor comprehension, recognize confusion, and adjust strategies when understanding breaks down (Pressley & Afflerbach, 1995; Zargar et al., 2020), regulation essential to independent reading. GenAI may undermine this when it intervenes before learners notice a problem, as automatic simplification or summarization can reduce opportunities to detect and repair breakdowns. It better supports metacognition by prompting learners to articulate difficulties and evidence before offering feedback, responding to demonstrated difficulty rather than pre-empting it, and progressively shifting monitoring responsibility to the

learner.

2.6 Implications for GenAI-Mediated Reading Support

Across all five dimensions, the central issue is not the function GenAI performs but its relationship to learner cognitive responsibility. Each function, vocabulary explanation, inferential support, summarization, background-knowledge provision, metacognitive prompting, can serve as scaffolding or substitution depending on timing, degree of cognitive work performed, and whether responsibility shifts back to the learner. GenAI best supports reading development when it removes barriers to engagement, elicits learner reasoning, supplies necessary knowledge, or responds to a prior attempt; it is less compatible when it pre-empts learner interpretation or continuously monitors comprehension on the learner's behalf. The guiding question is not "What can GenAI do for the reader?" but "What does the learner still need to do?", the cognitive foundation for the GAIRS framework developed later in the article. AI needs guided intervention to be effective in the classroom.

3. Scaffolding in Language Learning

3.1 What Constitutes Effective Scaffolding?

The concept of scaffolding emerged from Wood et al.'s (1976) account of tutoring and was subsequently developed through sociocultural perspectives on mediated learning and the zone of proximal development. Scaffolding is not synonymous with assistance. Rather, it refers to contingent support that enables learners to perform beyond their current independent capabilities while progressively developing their capacity for autonomous performance (Wood et al., 1976; van Lier, 1996).

Effective scaffolding has three interrelated properties: contingency, graduation, and temporariness. Contingent support responds to demonstrated learner need rather than being uniformly available in advance. Graduated support varies in intensity and directiveness as competence develops, shifting responsibility toward the learner. Temporary support is oriented toward reduction as learners acquire the knowledge, strategies, and regulatory capacities necessary for independent performance. These properties define the developmental character of scaffolding itself, whereas the analytic dimensions that guide the GAIRS framework, contingency, directiveness, and fading, provide criteria for evaluating how GenAI assistance functions within that developmental process. Together, they help distinguish support that enables learner cognitive activity from assistance that substitutes for it.

In EFL reading, scaffolding may take the form of a guiding question, attention to relevant textual evidence, modelling of an inferential strategy, or a prompt to reconsider an interpretation. Its defining property is not the quantity of assistance but its relationship to the target cognitive activity. Assistance is developmentally useful when it enables learners to engage in that activity more effectively without permanently assuming responsibility for it.

GenAI creates a distinctive scaffolding environment because conversational systems can respond dynamically to learner input. Responsiveness alone, however, does not constitute

scaffolding. GenAI assistance becomes developmental when it responds contingently to learner need, calibrates the amount of cognitive work performed by the system, and progressively supports the learner in assuming greater responsibility for the target activity.

3.2 Fading, Productive Difficulty, and Dependency

Scaffolding's temporary character serves its developmental function: the objective is independent performance, not merely successful performance under support. In GenAI-mediated reading, fading should therefore be understood as a progressive redistribution of cognitive responsibility. Assistance may initially address an immediate barrier, then shift toward prompts and requests for justification, and ultimately function as feedback or metacognitive questioning.

Fading, however, should not be equated with the elimination of difficulty. Research on productive failure and desirable difficulties suggests that certain forms of struggle can promote deeper processing, retrieval, and durable learning, even when they temporarily reduce performance efficiency (Kapur, 2008; Bjork & Bjork, 2011; Chen et al., 2018; Binks, 2026).

GenAI can remove such difficulties with considerable ease: it can define an unfamiliar word, supply an inference, explain a textual relationship, or summarize an entire passage. Yet the immediate reduction of effort should not be conflated with learning.

A useful distinction, therefore, is between productive and incidental difficulty, with the classification determined by the cognitive objective of the learning activity. Productive difficulty requires learners to engage in processes that constitute the intended learning outcome and should not be removed automatically. Incidental difficulty arises from barriers peripheral to that objective and may appropriately be reduced through targeted assistance. In an inferencing task, for example, the effort required to connect ideas that are not explicitly linked may be productive, whereas an obscure historical reference that obstructs access to those ideas may constitute an incidental barrier that targeted background information can legitimately address.

Dependency should likewise be conceptualized in terms of cognitive responsibility rather than frequency of GenAI use. A learner who regularly asks GenAI to challenge a self-generated interpretation may retain substantial responsibility for constructing and evaluating meaning,

whereas a learner who uses GenAI infrequently but routinely accepts its initial explanations without evaluation may still outsource critical comprehension processes. Dependency, therefore, is not adequately captured by how often GenAI is used; it is concerned with which components of the reading process the learner continues to perform independently.

Effective fading consequently involves a progressive transfer of cognitive responsibility from the system to the learner. The desired endpoint is not necessarily the absence of GenAI, but the learner's capacity to read, interpret, monitor, evaluate, and repair comprehension without requiring GenAI to perform these processes on the learner's behalf. Effective GenAI scaffolding, then, is defined not by reduced reliance on the technology but by the progressive expansion of the learner's capacity for independent cognitive control over reading.

4. GenAI Affordances and Scaffolding in EFL Reading

GenAI can shape how EFL learners access, process, and monitor texts through vocabulary explanation, linguistic simplification, question generation, summarization, background-knowledge provision, and personalized feedback. None is inherently scaffolding or substitutive; its pedagogical value depends on the contingency of support, the degree of directiveness with which it performs cognitive work, and whether assistance is progressively faded as learners assume greater responsibility. Section 4.7 outlines the conditions separating scaffolding from substitution, while Section 5 develops the theoretical framework for understanding when and why scaffolding becomes substitution.

4.1 Vocabulary Explanation

GenAI can define unfamiliar words, provide contextualized examples, explain register and connotation, and adapt explanations to learner proficiency. This flexibility can reduce lexical barriers that impede access to a text. Its scaffolding value is greatest when learners first attempt to infer meaning and then use GenAI to confirm, refine, or challenge that interpretation.

Definitions supplied before an attempt may perform cognitive work learners need to engage in themselves, reducing opportunities for lexical inference. As competence develops, support should shift toward confirmation and independent processing.

4.2 Linguistic Simplification

GenAI can rewrite complex sentences and passages, explain difficult grammatical structures, and adjust textual difficulty, enabling lower-proficiency EFL learners to access texts exceeding their current linguistic level. Simplification is most defensible as scaffolding when it provides temporary access to the original text. A learner might attempt the original passage, request simplification after persistent difficulty, and then return to the original text with greater understanding. Consistently replacing authentic texts with GenAI-modified versions, by contrast, risks substituting for the learner's processing of linguistic complexity.

Evidence suggests that GenAI-mediated simplification can improve immediate reading outcomes. Çelik et al. (2024), for example, reported significant gains in comprehension and inferencing among Turkish EFL undergraduates reading ChatGPT-simplified authentic blog texts, although reading anxiety was not significantly affected. Such findings support simplification's accessibility benefits but do not establish transfer to independent comprehension of unsimplified texts.

4.3 Question Generation

GenAI-generated questions targeting recall, inference, interpretation, evaluation, and synthesis can support self-testing and reflection. Questions requiring explanation, justification, or consideration of alternative interpretations can deepen processing, whereas GenAI-generated answers risk outsourcing the cognitive work required for comprehension and interpretation. A productive sequence involves GenAI-generated questions, learner responses, GenAI feedback or challenges, and learner revision or justification, allowing GenAI to structure the activity without assuming responsibility for comprehension.

4.4 Summarization

Summarization is consequential because accurate summaries require readers to identify central ideas, distinguish relevant from supporting information, integrate ideas, and construct a coherent representation of a text (Kintsch, 1998). A GenAI summary given before the learner reads or attempts one supplies the product without the process, substituting for a core reading operation. Lee and Jin (2025) found that having students draft their own summaries before comparing them with GenAI-generated versions improved comprehension. Youn et al. (2024) reported similar benefits for critical thinking and informed GenAI use.

Summarization thus functions as scaffolding when it follows, rather than precedes, learner engagement: learners draft first, compare their summaries with GenAI output, evaluate the differences, and revise their work. This sequence allows GenAI to provide feedback or an alternative representation while preserving the learner's responsibility for constructing meaning and progressively supporting more independent summarization.

4.5 Background-Knowledge Provision

GenAI can supply historical, cultural, topical, and domain-specific knowledge assumed by a text, which can be particularly valuable in EFL contexts where linguistic and knowledge gaps compound one another. Since learners cannot construct wholly absent knowledge, supplying genuinely missing information can be an enabling scaffold (Anderson & Pearson, 1984; Tsai, 2025). The key distinction is between supplying missing knowledge (e.g., explaining an unfamiliar cultural institution) and supplying the interpretation it supports (e.g., explaining what the author's reference to it means within the argument). The former aids comprehension, whereas the latter performs the learner's interpretive work.

4.6 Personalized Feedback

GenAI can evaluate learner-generated summaries, comment on interpretations, identify reasoning gaps, request supporting evidence, and suggest alternatives. This affordance offers strong scaffolding potential because support can be contingent on demonstrated learner performance.

For instance, after a learner proposes an interpretation with evidence, GenAI might ask for further support, suggest a competing view, or point out an overlooked detail. The learner remains responsible for constructing meaning: after an initial attempt, GenAI provides responsive prompts or feedback that the learner evaluates and uses to revise their work.

The value of personalized feedback lies less in personalization itself than in its contingency on learner effort and its orientation toward further reasoning rather than answer-giving. Feedback that consistently supplies answers without requiring learner reasoning shifts from scaffolding toward substitution. As learners develop greater competence, feedback can also be progressively faded or shifted toward prompts that encourage increasingly independent evaluation and self-regulation.

4.7 From GenAI Affordances to Scaffolding Conditions

The six affordances illustrate that GenAI functions cannot be classified as inherently scaffolding or substitutive. Their pedagogical status depends on how GenAI assistance relates to learner activity, particularly in terms of contingency, directiveness, and fading. Assistance is more likely to function as scaffolding when it responds to demonstrated learner need, performs no more cognitive work than the learning objective requires, and is progressively reduced or reconfigured as learners assume greater responsibility for the relevant cognitive processes.

5. When Scaffolding Becomes Substitution

5.1 The Risk of Outsourcing Comprehension

The affordances discussed in Section 4 become problematic not when learners use GenAI, but when GenAI assumes cognitive operations, such as constructing meaning, making inferences, resolving ambiguity, integrating information, and monitoring comprehension, that EFL learners need to develop. Vocabulary explanations, simplified passages, answers, summaries, or interpretive explanations support learning when they address genuine barriers while preserving these operations, but become substitutive when they perform them on the learner's behalf.

This risk extends across affordances: whether the outsourced operation involves lexical inference, main-idea identification, or interpretive reasoning, learners may gain the product of comprehension without engaging in the process that produces it. GenAI intensifies this risk because it places few constraints on when assistance can be requested or how directly it can perform cognitive work. Learners can request interpretations, summaries, or answers before attempting a task and receiving them immediately, so responsiveness does not guarantee developmental appropriateness. The central concern, then, is repeated outsourcing of operations learners can reasonably perform themselves, which, when habitual, may allow task completion without competence development.

5.2 Reduced Cognitive Engagement

Cognitive engagement refers to the mental effort invested in understanding a task (Fredricks et al., 2004). In reading, this includes retrieving knowledge, resolving ambiguity, making inferences, integrating ideas, and monitoring comprehension. GenAI can reduce this engagement when these processes become immediately available as external products. A learner who receives a word's meaning, an implicit relationship, or a summary without performing the corresponding inference, construction, or integration may complete the task while engaging less deeply in processes essential to reading development.

This distinction matters because successful performance does not necessarily indicate learning or transfer. Conditions facilitating immediate performance may weaken learning by reducing the effortful processing through which knowledge and skills develop (Soderstrom & Bjork, 2015). Cognitive offloading is not inherently undesirable; external resources can reduce unnecessary demands and improve efficiency (Risko & Gilbert, 2016). It only becomes problematic when learners repeatedly offload processes that constitute the intended learning

objective rather than using assistance to overcome barriers to performing those processes themselves.

Evidence from related domains illustrates this concern. Fan et al. (2025), comparing university students revising writing with ChatGPT, a human expert, a writing-analytics tool, or no support, found differences in self-regulated learning behavior and “metacognitive laziness” in the ChatGPT condition. Although this evidence concerns writing rather than reading and cannot establish an EFL reading effect, it indirectly supports the concern that GenAI-mediated performance may not correspond to equivalent development of independent self-regulatory processes. Improved performance in GenAI-mediated EFL reading should therefore not be treated as sufficient evidence of reading development.

5.3 Over-Reliance and Learner Dependency

Repeated outsourcing may develop into persistent reliance on external assistance. Automation research suggests that users can become dependent on systems that consistently perform tasks efficiently (Parasuraman & Manzey, 2010). In EFL reading, this may appear as routinely consulting GenAI for unfamiliar words instead of using contextual information, requesting summaries before identifying main ideas, or seeking confirmation before forming an interpretation.

Dependency also has a metacognitive dimension. When learners rarely experience unaided success, they have fewer opportunities to calibrate what they can accomplish independently. Repeated reliance may lead them to view GenAI as necessary even when tasks remain within their capabilities. Self-efficacy theory suggests that perceived capability influences willingness to attempt challenging tasks and persist through difficulty (Bandura, 1997). If learners believe they cannot read effectively without GenAI, they may avoid the struggles through which reading competence develops.

GenAI use should not, however, be equated with dependency. Learners can use external assistance while retaining control over the interaction and responsibility for the underlying cognitive work. Dependency is better understood as a pattern in which GenAI becomes necessary for tasks learners could reasonably perform independently, reducing opportunities to develop and demonstrate competence. Fading is therefore essential to responsible GenAI integration because support should not remain at the same level of directiveness as learners develop greater competence. The objective is not to eliminate assistance, but to prevent it from becoming a permanent substitute for competence.

5.4 Accessing Meaning versus Constructing Meaning

The preceding argument can be distilled into a distinction between accessing and constructing meaning. GenAI can make meaning rapidly accessible by explaining a sentence, translating a passage, identifying a main idea, resolving ambiguity, or summarizing an argument. Such access has genuine pedagogical value: learners may require assistance to overcome linguistic, cultural, or informational barriers that would otherwise prevent engagement with an authentic text.

Reading development, however, requires more than access to an already-constructed interpretation. It requires learners to participate in constructing meaning by recognizing linguistic relationships, activating relevant knowledge, generating and evaluating inferences, integrating information, identifying comprehension problems, and repairing them. The critical distinction is therefore not between assisted and unassisted reading, but between assistance that enables cognitive participation and assistance that removes the need for it.

This distinction also explains why neither maximal nor minimal GenAI assistance is adequate. Withholding support when learners encounter genuinely inaccessible background knowledge may restrict participation, whereas unrestricted assistance may reduce engagement and independent performance. The pedagogical objective is therefore calibrated assistance: sufficient support for meaningful engagement without eliminating the cognitive activity that constitutes the learning objective. Achieving this balance requires attention to when assistance is introduced, how directly it performs the relevant cognitive work, and how support is progressively reconfigured or withdrawn as learners develop greater independence. Section 6 develops this objective into the GAIRS framework.

5.5 The Pedagogical Imperative: Calibrated Assistance

The preceding analysis yields a clear pedagogical imperative. The question is not whether GenAI should be used in EFL reading, but how assistance can be calibrated so that learners receive sufficient support to engage meaningfully while retaining responsibility for the processes on which independent reading competence depends. The governing principle is therefore not simply less GenAI, but less unnecessary cognitive substitution.

This is the problem addressed by the GAIRS model. Rather than treating GenAI as either a solution or a threat, GAIRS provides a framework for calibrating support through contingency, directiveness, and fading. The model recognizes that effective scaffolding requires assistance to be contingent on demonstrated learner need, calibrated so that it performs no more cognitive work than necessary for the learning objective, and progressively faded as learners develop greater competence. GenAI should therefore shift gradually from performing reading work for the learner toward supporting the learner in performing that work independently.

5.6 Theoretical Contribution of GAIRS

GAIRS builds on established concepts of scaffolding, cognitive offloading, learner autonomy, and AI-supported learning, but extends these perspectives by specifying how cognitive responsibility is distributed between the learner and GenAI during reading. Existing perspectives generally explain the value of support, the delegation of cognitive tasks, or the importance of learner independence; they provide less precise guidance on how Gen assistance should be calibrated so that support improves access without progressively replacing the cognitive work through which reading competence develops.

GAIRS addresses this gap through three interrelated dimensions: contingency, directiveness, and fading. Contingency specifies when AIGen assistance should be introduced in relation to learner need; directiveness specifies the extent to which cognitive responsibility is transferred from learner to Gen; and fading specifies how that responsibility should progressively return

to the learner. The framework therefore shifts the central question from whether Gen provides support to who performs the cognitive work required for learning.

The theoretical contribution of GAIRS is consequently not simply a new taxonomy of AIGen support. Rather, it proposes cognitive responsibility as a central mechanism linking AIGen assistance to learner cognitive engagement and developing independence. The four GAIRS configurations, Independent Attempt, Responsive Prompt, Targeted Explanation, and Collaborative Interpretation, represent different distributions of this responsibility rather than merely different amounts of technological assistance.

In this way, GAIRS provides a conceptual account of the conditions under which AIGen-mediated support can function as scaffolding and the conditions under which it may become cognitive substitution. This distinction offers a basis for designing, evaluating, and progressively reducing GenAI support in EFL reading.

6. A Conceptual Framework for AI-Mediated EFL Reading

The preceding sections establish the theoretical foundations for a framework of GenAI-mediated reading support. Section 2 conceptualized EFL reading as interrelated cognitive and metacognitive processes; Section 3 characterized effective scaffolding in terms of contingency, graduated support, temporariness, and preserved cognitive effort; Sections 4 and 5 examined the affordances through which GenAI can intervene in reading and the conditions under which such intervention shifts from support toward substitution.

This section integrates these propositions into the Graduated AI-Mediated Reading Support (GAIRS) framework. GAIRS does not classify particular GenAI tools as inherently beneficial or harmful; it specifies the pedagogical conditions under which GenAI assistance is more or less likely to contribute to independent EFL reading competence. Its central premise is that developmental value depends on the relationship among learner effort, GenAI intervention, and the progressive transfer of cognitive responsibility to the learner.

6.1 Two Developmental Pathways

GAIRS distinguishes between two contrasting trajectories of learner–GenAI interaction. These are not rigid categories but patterns toward which GenAI-supported reading may develop.

As illustrated in Figure 1, these trajectories represent two contrasting developmental pathways: (1) Scaffolding and Progressive Independence and (2) Substitution and Increasing Reliance.

Pathway A: Scaffolding and Progressive Independence begins with a learner attempt, followed by contingent assistance that addresses a demonstrated difficulty without unnecessarily replacing the target cognitive process. The learner then uses the support to revise, extend, or complete the task, while the assistance becomes progressively less directive as the learner's competence develops. This process promotes sustained cognitive engagement, increasing learner responsibility and, ultimately, greater independent capability.

Pathway B: Substitution and Increasing Reliance occur when GenAI is used pre-emptively or

as a default source of comprehension, providing finished interpretations or solutions before the learner has engaged with the relevant cognitive task. Repeated use of GenAI assistance may reduce opportunities for independent problem-solving and productive cognitive engagement, resulting in successful task performance without corresponding development of the underlying reading processes. Over time, this pattern may encourage reduced learner effort, immediate task completion, limited cognitive engagement, and continued reliance on GenAI assistance.

The two pathways may appear superficially similar: in both, a learner may consult GenAI while reading a difficult passage. What distinguishes them is what happens before the intervention, what the system provides, what the learner subsequently does, and where cognitive responsibility ultimately resides.

The distinction is therefore process-based rather than tool-based. The same GenAI function may contribute to either trajectory depending on its contingency, directiveness, and subsequent fading. These three dimensions constitute the governing principles of GAIRS.

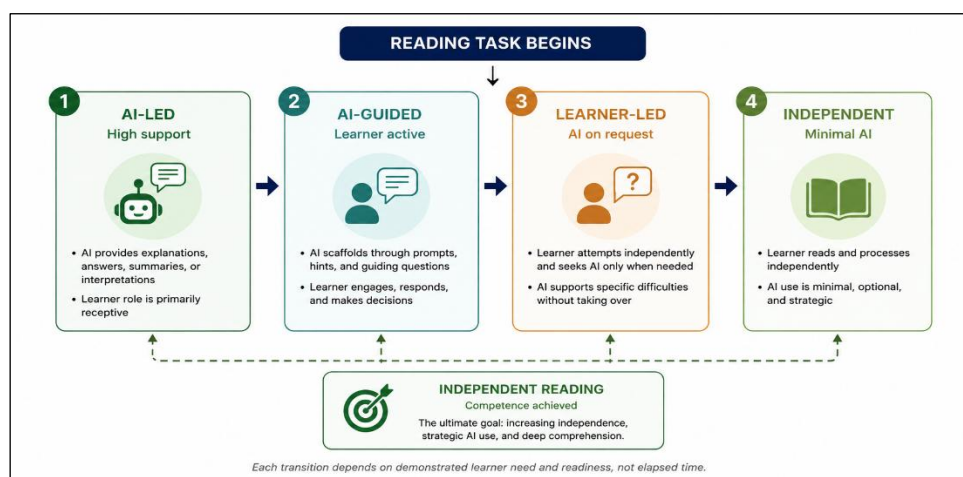


Figure 1. Two Developmental Pathways in the GAIRS Framework

6.2 Three Governing Dimensions

Contingency

Contingency concerns when and why assistance is introduced. High-contingency use occurs when learners first attempt the relevant reading process, identify a specific difficulty, and then seek targeted assistance. Low-contingency use occurs when AI is consulted automatically, before the learner has attempted the task, or without a clearly identified need.

Contingency does not require learners to struggle indefinitely. Where an essential knowledge gap or incidental barrier prevents meaningful engagement, timely assistance may be appropriate. Its purpose is therefore not to maximize delay, but to prevent GenAI from

unnecessarily pre-empting cognitive activity that the learner can reasonably perform.

Directiveness

Directiveness concerns the extent to which assistance prompts learner activity or supplies a completed cognitive product. Lower-directiveness support may include hints, guiding questions, requests for textual evidence, or prompts to reconsider an interpretation. Higher-directiveness support may include definitions, translations, summaries, explanations, or completed interpretations.

Directiveness is relative to the learning objective. A direct explanation of an unfamiliar historical reference may be appropriate when the reference constitutes an incidental knowledge barrier; the same explanation may be counterproductive when the instructional objective is contextual inference. GAIRS therefore does not assume that lower directiveness is always preferable. Rather, directiveness should be proportionate to learner's need and to the cognitive process that constitutes the learning objective.

Fading

Fading concerns about how assistance and cognitive responsibility change over time. It involves more than reducing the frequency of AI use: support may remain available while becoming less directive, narrower in scope, or increasingly learner controlled.

A learner may therefore continue to use AI regularly while becoming more independent if interactions shift from direct answers toward prompts, feedback, and evaluation. The developmental endpoint is not technological abstinence but independent control of the target reading processes. Fading is successful when responsibility progressively shifts from the system to the learner.

Taken together, the three dimensions, as summarized in Figure 2, answer complementary questions: contingency asks when assistance should intervene; directiveness asks how much of the cognitive work the assistance performs; and fading asks how responsibility should change over time.

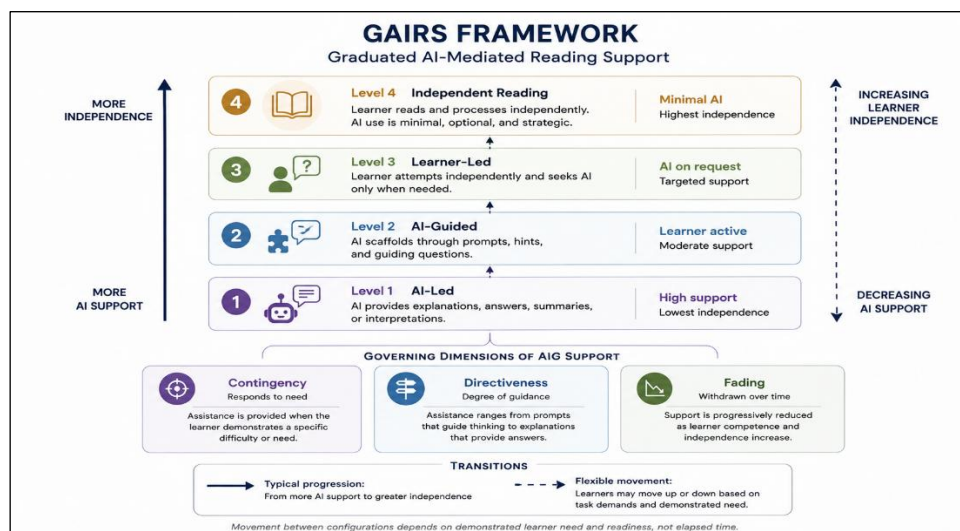


Figure 2. The Three Governing Dimensions of the GAIRS Framework

6.3 Four Graduated Levels of Support

The three governing dimensions provide the basis for four graduated configurations of learner–AI interaction. The levels represent increasing degrees of GenAI involvement rather than a hierarchy of pedagogical value. Movement between them should remain contingent on the learner, task, and learning objective. The four levels and the dynamic movement between them are illustrated in Figure 3.

Level 1: Independent Attempt. The learner engages with the text without AI intervention, using available strategies such as contextual inferencing, rereading, activation of prior knowledge, identification of textual relationships, and comprehension monitoring.

Level 1 functions as the baseline condition from which assistance may be introduced. It is not a requirement that all learners complete an extended unaided reading period. Where a genuine knowledge gap or accessibility barrier prevents meaningful engagement, assistance may be sought earlier. The governing principle is simply: do not replace a cognitive process that the learner can reasonably attempt independently.

Level 2: Responsive Prompt. AI responds to a difficulty identified through the learner’s attempt. Assistance remains relatively low in directiveness and is designed to stimulate further reasoning through hints, guiding questions, requests for evidence, or prompts for reconsideration.

For example, rather than answering “What does this paragraph imply?” with a completed interpretation, GenAI might ask: “What does the final sentence suggest about the author’s position? What evidence in the paragraph led you to that interpretation?” The aim is to return the learner to the text while preserving the inferential or evaluative work that constitutes the learning target.

Level 3: Targeted Explanation. More direct assistance is provided when lower-directiveness

support is insufficient or when the difficulty concerns knowledge the learner could not reasonably be expected to construct independently. GenAI may define an unfamiliar term, explain syntax, clarify a cultural reference, or provide necessary background information.

The explanation should address the specific barrier rather than unnecessarily solving the broader comprehension problem. If an unfamiliar historical event prevents understanding, for example, a concise explanation may remove that incidental barrier while leaving the subsequent interpretation to the learner.

Level 4: Collaborative Interpretation. This represents the highest degree of GenAI involvement in GAIRS and should be used when substantial difficulty remains or when collaborative interpretation is itself an instructional objective. GenAI may contribute more substantially to constructing an interpretation, organizing ideas, modelling analysis, or developing a guided summary.

Greater AI involvement should not, however, eliminate learner responsibility. Learners should still be required to process, evaluate, restate, apply, or critique the resulting interpretation. AI-generated interpretations therefore function as provisional cognitive bridges rather than final learning products.

Level 4 is consequently a high-support condition, not a preferred endpoint. Its developmental value depends on subsequent opportunities to perform the relevant reading processes with less assistance, a principle represented by the developmental movement across the levels in Figure 3.

6.4 Movement Within and Across Levels

GAIRS is dynamic rather than strictly linear. As illustrated in Figure 3, learners may move within and across the four levels of support according to the nature of the difficulty encountered. A learner may operate at Level 1 (Independent Attempt) for most of a text, move briefly to Level 2 (Responsive Prompt) when encountering an inferential difficulty, escalate to Level 3 (Targeted Explanation) when an unfamiliar cultural reference is identified, and then return to Level 1 once the barrier has been resolved.

Similarly, different learners may require different levels of support for the same passage. GAIRS therefore treats assistance as a local, contingent decision, rather than assigning a fixed level of GenAI dependence to a learner or lesson.

Figure 3 also distinguishes between two forms of movement: task-level escalation and developmental progression. Escalation occurs when a particular difficulty cannot be resolved with the current level of support and the learner therefore moves to a higher-support configuration. Developmental progression occurs across repeated learning opportunities, when learners increasingly accomplish comparable tasks at lower levels of assistance. A learner who initially requires Level 3 support for a particular inferential problem may later resolve similar

problems at Level 2 and eventually at Level 1.

This movement provides an important indicator of whether GenAI is functioning as scaffolding. As represented by the developmental progression in Figure 3, increasing success with less-directive support is consistent with growing independence; persistent reliance on high-directiveness assistance for familiar processes may instead indicate cognitive substitution.

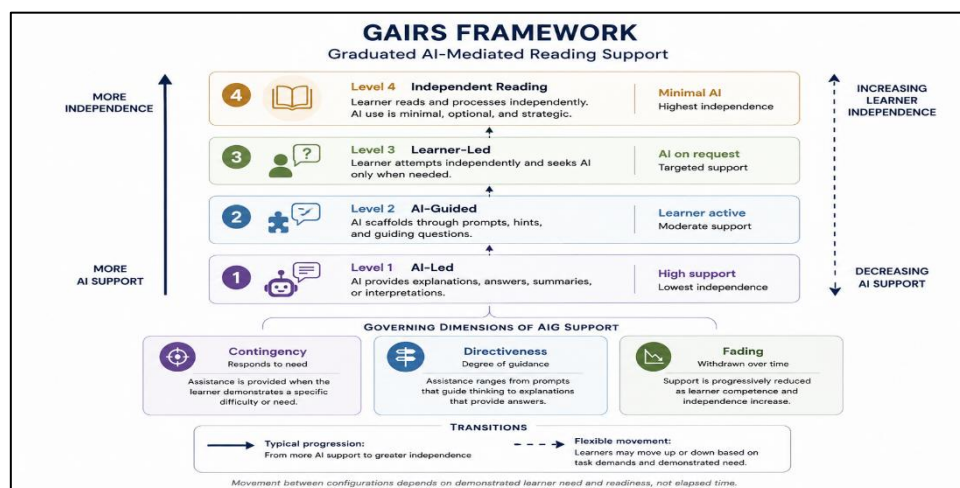


Figure 3. Dynamic Movement Within and Across the GAIRS Levels of Support

6.5 Operationalizing GAIRS

For GAIRS to function as a research framework, its central constructs must be observable in instructional practice. AI-supported reading episodes can therefore be examined through four indicators:

- **Contingency**: Did the learner attempt the relevant process before requesting assistance, and did the response address a demonstrated difficulty?
- **Directiveness**: Did the assistance primarily prompt learner reasoning, or provide a completed cognitive product?
- **Fading**: Did the frequency, directiveness, or scope of assistance decrease as learners encountered comparable tasks over time?
- **Learner responsibility**: Did learners generate, justify, evaluate, and revise interpretations themselves rather than merely reproduce GenAI-generated responses?

These indicators make GAIRS amenable to empirical investigation. Future studies could compare different sequences of AI assistance, code interactions according to contingency and directiveness, and examine whether progressive reductions in support predict stronger performance on subsequent unaided reading tasks.

The framework also generates testable questions: Do learners receiving contingent, low-

directiveness support demonstrate greater improvement on subsequent unaided reading tasks than learners receiving immediate explanations? Does progressive reduction in directiveness promote stronger transfer than stable high-directiveness assistance? Do learners who generate and evaluate interpretations before receiving GenAI feedback develop stronger metacognitive regulation than those who receive GenAI interpretations first?

6.6 Summary of the GAIRS Framework

GAIRS reframes the question “Should learners use AI while reading?” as a more analytically useful set of questions: When should GenAI intervene? How directive should assistance be? What cognitive work should remain with the learner? And how should responsibility change as competence develops?

Taken together, the three figures represent complementary components of this conceptual architecture. Figure 1 identifies the contrasting developmental trajectories that GenAI-mediated reading may follow; Figure 2 specifies the governing dimensions through which GenAI assistance can be regulated; and Figure 3 represents the dynamic movement through which learners may receive, escalate, and progressively reduce support across the four GAIRS levels.

The framework proposes that AI-mediated reading is most likely to support development when assistance is contingent on demonstrated need, calibrated to the learning objective, sufficiently non-directive to preserve productive cognitive activity, and progressively faded as competence develops. More direct assistance remains legitimate when learners encounter knowledge gaps or barriers that cannot reasonably be resolved through the target cognitive process, but such assistance should function as a bridge rather than a permanent substitute for independent performance.

The central proposition of GAIRS is therefore that the goal of AI-mediated reading support is not to minimize GenAI use or maximize learner struggle, but to maximize meaningful learner cognitive responsibility while providing sufficient assistance to sustain access to the text.

GAIRS thus shifts attention from how much GenAI learners use to what cognitive responsibility remains with learners when they use it. This principle makes the framework applicable across GenAI systems, reading tasks, proficiency levels, and instructional settings, because it is grounded in the pedagogical structure of GenAI use rather than the technical features of a particular tool. Figures 1–3 collectively illustrate this structure. It also provides the conceptual basis for the instructional principles and implementation recommendations that follow.

7. Pedagogical and Assessment Implications

If GAIRS proposes that GenAI assistance should be optimized rather than maximized, its implications extend beyond individual learner behaviour to instructional design, curriculum development, self-regulation, GenAI literacy, assessment, and institutional policy. The framework neither advocates unrestricted GenAI use nor its exclusion from reading instruction.

Rather, it provides a basis for aligning the purpose, timing, directiveness, and duration of GenAI assistance with the cognitive processes targeted by particular learning activities.

7.1 Teachers

Teachers translate GAIRS into classroom practice by designing tasks that structure when and how GenAI enters the reading process. Learners can first engage with a text, identify difficulties, and formulate tentative interpretations or supporting evidence before seeking assistance. Subsequent GenAI interaction can then address identified difficulties without replacing the broader reading process.

Teachers can also model different forms of assistance, including hints, guiding questions, feedback, alternative interpretations, and targeted explanations, rather than default answer-seeking prompts. Comparing these forms can reveal how different GenAI responses distribute cognitive responsibility between learner and system.

The GAIRS levels can additionally serve as a diagnostic resource. Persistent reliance on highly directive assistance may signal difficulties in vocabulary inference, inferencing, comprehension monitoring, or other underlying reading processes. Sustainable implementation need not require teachers to monitor every interaction. Recurring routines in which learners attempt tasks, identify difficulties, seek proportionate assistance, and re-engage independently can embed GAIRS principles within ordinary reading instruction.

7.2 Curriculum Design

Curriculum designers can integrate GenAI support into instructional progression rather than treating it as an ad hoc feature of individual lessons. Earlier stages may incorporate structured prompting and targeted explanations as learners develop strategies for approaching demanding texts. Later stages can emphasize independent reading, delayed consultation, learner-generated interpretations, and critical evaluation of GenAI responses.

Crucially, progression should concern the nature of AI use rather than simply its quantity. AI access may remain available throughout the course while shifting from direct explanation toward prompting, feedback, and alternative perspectives. Curriculum specifications can make this progression explicit by identifying the intended purpose, degree of directiveness, and expected learner responsibility for AI use in particular reading activities.

7.3 Learner Self-Regulation

Because GenAI is readily available whenever assistance is requested, GenAI-mediated reading places greater demands on learners' self-regulatory judgment. Learners must determine not only whether assistance is necessary, but also what form is compatible with the learning objective.

Instruction can help learners distinguish difficulties by warranting external support from those addressable through rereading, contextual analysis, inference, or strategic effort. Learners can be encouraged to formulate tentative interpretations before consulting GenAI and evaluate its responses against textual evidence rather than accepting them as authoritative.

Reflective activities can further make GenAI use an object of metacognitive regulation. Learners might record what they found difficult, what they attempted independently, when and why they sought assistance, what support they requested, and whether they could subsequently perform a comparable task with less assistance. Such routines shift GenAI use from an automatic response to difficulty toward a consciously regulated learning strategy.

7.4 AI Literacy for Reading

Reading-specific AI literacy involves recognizing unnecessarily directive responses, checking interpretations against textual evidence, distinguishing barrier reduction from cognitive substitution, and identifying when AI consultation has become habitual rather than necessary. GenAI literacy therefore intersects directly with learner autonomy (Little, 1991; Benson, 2011): autonomous AI use entails informed, purposeful decisions about when, why, and how assistance should enter the reading process. Recent work further emphasizes the changing distribution of agency between learners and AI. Ji et al. (2026), for example, reconceptualize self-regulated learning as distributed human–GenAI co-regulation, while Reinders (2026) proposes “hybrid autonomy,” describing how learners must critically negotiate control and agency in interactions with GenAI systems.

7.5 Assessment

GenAI complicates reading assessment because a correct response may demonstrate comprehension while providing little evidence of whether the learner independently constructed, evaluated, and monitored the interpretation. Assessment should therefore distinguish between independent reading competence and productive GenAI-mediated reading competence. When independent reading is the target, assessment should reveal learners’ unaided inferential, interpretive, and monitoring capacities through unseen texts, controlled in-class tasks, or learner-generated explanations requiring explicit textual evidence.

When strategic GenAI use is an intended competence, assessment can examine the quality of learner–AI interaction. Relevant criteria include identifying genuine comprehension difficulties, formulating proportionate requests for assistance, evaluating GenAI responses against textual evidence, and revising interpretations accordingly.

A robust assessment design may therefore combine independent and GenAI-mediated components. Independent tasks establish what learners can accomplish without external cognitive support, while AI-mediated tasks assess whether they can regulate and evaluate assistance strategically. Assessment conditions should therefore follow the competence being measured rather than a generalized assumption that GenAI use is acceptable or unacceptable.

7.6 Institutional Implications

Institutions adopting GenAI for language learning require guidance that moves beyond binary classifications of permissible and prohibited use. Institutional policies can instead distinguish among pedagogical purposes and forms of assistance, specifying when GenAI may function as a prompt, feedback mechanism, targeted explainer, or collaborative resource and when independent performance is required.

Such policies can align institutional expectations with curriculum design, classroom practice, and assessment. Rather than treating GenAI use as a unitary category, institutions can recognize that its educational value depends on how assistance is structured, what cognitive work remains with the learner, and what learners are ultimately expected to accomplish independently.

8. Future Research Agenda

As a conceptual framework, the present analysis does not provide empirical evidence for the propositions advanced by GAIRS. Its contribution is to specify relationships for systematic investigation. The resulting research agenda centers on a fundamental question: under what conditions does GenAI-supported reading contribute to independent reading competence rather than merely enhance performance during GenAI-assisted tasks?

First, the three governing dimensions of GAIRS, contingency, directiveness, and fading, require experimental examination. Studies could compare learners using the same GenAI system under systematically different conditions, such as contingent prompting after an initial learner attempt versus immediate access to direct explanations or answers. Outcomes should distinguish GenAI-assisted from subsequent unaided performance. If GAIRS is correct, contingent, less-directive assistance should produce stronger transfer to independent reading than immediate, unrestricted access.

Second, longitudinal research is needed to establish whether GenAI assistance has developmental consequences. Single-session and cross-sectional studies may demonstrate performance benefits but cannot determine whether repeated reliance on highly directive assistance strengthens or weakens independent reading competence over time. Longitudinal research could track GenAI interaction patterns alongside unaided reading to examine whether learners increasingly perform relevant processes independently and whether such development occurs spontaneously or requires deliberate fading. Reduced GenAI use should not itself be treated as evidence of development. The more meaningful outcome is increasing independent cognitive responsibility.

Third, the four-level structure of GAIRS requires empirical validation. Research should determine whether independent attempt, responsive prompt, targeted explanation, and collaborative interpretation represent sufficiently distinct learner–GenAI configurations to warrant separate levels. Interaction logs, learner think-alouds, stimulated-recall interviews, and measures of cognitive engagement could establish whether the proposed levels correspond to meaningful differences in cognitive responsibility. Such research may refine, subdivide, combine, or reconceptualize the levels.

Fourth, research should examine boundary conditions and individual differences. Appropriate assistance is unlikely to be uniform across learners, texts, and tasks. Its effectiveness may depend on L2 proficiency, vocabulary knowledge, prior topic knowledge, reading strategy use, text difficulty, and task purpose. For example, direct background-knowledge support may appropriately remove an incidental barrier for a lower-proficiency learner, whereas an advanced learner might benefit more from an inferential prompt. Experimental and mixed-

methods research should therefore investigate interactions among learner characteristics, task demands, and GAIRS dimensions.

Fifth, GAIRS should be examined as a principle of GenAI-system and interface design rather than solely as a framework for teacher or learner behaviour. GenAI systems differ in their tendency to provide direct answers, prompt reflection, request evidence, or encourage clarification. Research could compare conventional interfaces with systems explicitly configured around GAIRS principles, such as interfaces that initially provide prompts rather than solutions, require textual justification, or progressively reduce directiveness across repeated tasks. Such work could determine whether scaffolding can be systematically embedded in GenAI-mediated reading environments.

Sixth, intervention research should examine whether reading-specific GenAI literacy improves learners' regulation of assistance. Instruction could teach learners to identify genuine comprehension difficulties, select proportionate assistance, evaluate GenAI interpretations against textual evidence, and monitor reliance. Comparing conventional GenAI-use instruction with instruction based on contingency, directiveness, and fading could determine whether such literacy improves subsequent unaided reading performance.

Finally, the scope and boundaries of GAIRS should be examined beyond EFL reading. Writing, listening, and speaking involve different cognitive processes and relationships between performance and GenAI assistance, so the framework should not be assumed to generalize unchanged. Comparative research can determine which principles are specific to reading and which reflect broader conditions under which GenAI supports developing competence rather than substitutes for it.

Taken together, these directions position GAIRS as a testable conceptual framework rather than a prescriptive model whose assumptions are treated as established findings. Its central proposition is consequential but falsifiable. Under appropriate conditions, calibrated GenAI assistance should produce stronger development of independent reading competence than assistance that maximizes immediate task performance through cognitive substitution. Evidence supporting this proposition would strengthen GAIRS, whereas evidence showing that more directive or unrestricted assistance produces equivalent or superior independent learning would require its modification. Such scrutiny is essential for moving the field beyond whether GenAI improves performance toward the more consequential question of how GenAI-supported performance becomes independent competence.

9. Conclusion

Generative AI has not created the tension between accessibility and cognitive effort examined in this article. That tension has long accompanied language pedagogy, evident in debates over graded readers, glossing, translation, and appropriate assistance during reading. What GenAI has altered is the scale, immediacy, and granularity of assistance available to learners. Translation, explanation, inference, summary, and interpretation can now be generated with minimal delay, potentially before learners have meaningfully engaged with the text. The central

pedagogical challenge is therefore structuring assistance so that greater access does not displace the cognitive processes through which reading competence develops.

This article has argued that neither categorical rejection nor uncritical adoption provides an adequate response. The more productive distinction is between assistance that supports learners in constructing meaning and assistance that substitutes for meaning construction. GAIRS develops this distinction through three governing dimensions, contingency, directiveness, and fading, and four graduated learner–GenAI configurations, from independent attempts to collaborative interpretation.

The educational value of GenAI cannot therefore be determined by the amount or frequency of assistance. The more consequential question is what cognitive responsibility remains with the learner. GenAI can reduce incidental barriers, supply necessary knowledge, and provide responsive support that enables engagement with otherwise inaccessible texts. Yet the same capabilities can pre-empt inferencing, integration, evaluation, and comprehension monitoring when assistance is premature, overly directive, or insufficiently faded.

Accordingly, effective GenAI-mediated EFL reading should be understood not as maximal assistance or minimal technology use, but as calibrated assistance that preserves and progressively expands learner cognitive responsibility. Scaffolding should not make reading permanently easier but make independent reading increasingly possible. The ultimate measure of successful GenAI integration is therefore not how effectively technology performs comprehension for learners, but whether learners become increasingly capable of constructing, evaluating, and regulating meaning themselves.

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Acknowledgments

Not Applicable.

Funding

Not Applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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