CHAPTER I
INTRODUCTION

This chapter presents the research background, research problems, research question, purposes of the study, research significance, conceptual framework, research contribution, and previous study.

A. Research Background

Writing is one of the four language skills that plays a central role in enabling learners to express ideas, construct meaning, and communicate effectively, it requires sustained practice and the integration of specific sub-skills (Brown, 2001). For EFL learners, writing is particularly demanding because it requires the simultaneous integration of linguistic knowledge, cognitive processing, and cultural understanding (Hyland, 2019). At the senior high school level, writing competence is especially consequential, as it prepares students for the literacy demands of higher education and future professional life.

Beyond grammatical accuracy and mechanical correctness, effective writing also depends on creativity, the capacity to generate original ideas, construct engaging narratives, and adapt expression to different communicative purposes (Guilford, 1967). Within the framework of 21st-century skills, creativity is regarded as a core competence alongside critical thinking, collaboration, and communication. In EFL classrooms specifically, creative writing has been shown to deepen learners' engagement while simultaneously supporting language development (Ahiskali & Maltepe, 2023), which is why creativity is increasingly argued to require deliberate integration into writing instruction rather than being treated as incidental (Prasetya & Lustyantie, 2025).

The emergence of AI, particularly large language models such as ChatGPT, has introduced new instructional possibilities for EFL writing (Polakova & Ivenz, 2024; Zainab & Parveen, 2026). AI tools can offer vocabulary suggestions, sentence modelling, and immediate feedback that reduce linguistic barriers (Tusino et al., 2025; Capah et al., 2025), and several studies report that such support can enhance writing quality and stimulate creative thinking through alternative expressions and idea prompts (Oruç et al., 2026; Kızıltaş, 2025). By reducing the cognitive load associated with lower-order linguistic tasks, AI is also argued to free

learners' attention for higher-order concerns such as idea development and narrative construction (Aslam et al., 2025).

At the same time, this growing reliance on AI has raised pedagogical concern. Several studies suggest that when students depend excessively on AI-generated suggestions, their independent thinking and originality may decline (Jabarin et al., 2025; Mazhar & Arseven, 2025), and that AI may standardize language use in ways that erode students' individual voice (Bariqoh, 2025; Tsai et al., 2024). Chan and Hu (2023) further note that students' sense of authorship and ownership over their own writing can become ambiguous once AI participates substantially in idea generation. These concerns point to a central instructional question, not whether AI should be used in writing instruction, but how it can be positioned so that it supports, rather than substitutes for, students' own cognitive and creative engagement (Alzubi et al., 2025).

One response to this concern is to reconceptualize AI's pedagogical role as a scaffold rather than a generator. Wang and Stojković (2026) propose that AI can function as a metacognitive and dialogic scaffold, supporting learners as they question, explore alternatives, evaluate suggestions, and reflect on their own ideas rather than simply accepting AI output. This positioning aligns with Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD), in which temporary, targeted assistance enables learners to accomplish what they could not yet achieve independently. In the present study, AI is accordingly framed as a thinking and dialogue partner, students retain responsibility for generating, evaluating, and finalizing their own creative decisions, while AI-assisted meta-prompting provides the scaffolding needed to sustain that process (Wang & Stojković, 2026).

A second, complementary response concerns how the broader learning environment is designed to support students while they engage with AI. Brain-Based Learning (BBL) emphasizes instructional conditions attuned to how the brain naturally learns, including emotional engagement, meaningful context, active knowledge construction, and low-anxiety environments (Caine & Caine, 1991; Immordino-Yang et al., 2025). These principles are relevant to AI-assisted writing because they address a risk that scaffolding alone does not fully resolve, interacting with AI systems can itself introduce cognitive load that undermines students' capacity for creative engagement (Pengelley et al., 2025; Al-Jarf, 2026). When AI-assisted scaffolding is embedded within a BBL-informed environment, students are

given not only guided support for their thinking, but also the emotional and cognitive conditions that make sustained creative effort possible.

Finally, narrative comic writing was selected as the pedagogical medium for this study because it offers a form of creative expression that extends beyond verbal text alone. Comics combine visual and verbal modes, which can reduce cognitive load, stimulate imagination, and support comprehension through contextualized visual cues (Mayer, 2009; Liu, 2004), while also providing an engaging platform for developing narrative structure and expressive language (Rumapea et al., 2025). For senior high school EFL learners in particular, this multimodal format allows creativity to be expressed and observed in ways that a purely verbal writing task may not fully capture.

Taken together, the pedagogical value of creativity in EFL writing, the promise and risk of AI-assisted writing, AI-assisted scaffolding as a way of preserving students' cognitive agency, BBL as a way of supporting the learning environment in which that scaffolding occurs, and comic writing as a multimodal medium for creative expression, form the conceptual starting point for this study. The following section narrows this broad context into the specific problem that the present study addresses.

B. Research Problem

Empirical research on AI-assisted EFL writing has generally reported favorable outcomes, including improvements in idea generation, language accuracy, and overall writing quality (Kasneci et al., 2023; Duong & Chen, 2025; Zhao, 2025; Stadnik et al., 2025; Hasibuan & Hasibuan, 2025; Nguyen et al., 2025; Tajik, 2025). However, when the focus narrows specifically to creativity rather than writing performance in general, the picture becomes considerably less settled. Several studies report that excessive reliance on AI is associated with reduced originality and weaker independent thinking (Jabarin et al., 2025; Nhan et al., 2025; Mazhar & Arseven, 2025), even as other studies report that AI can support creative thinking when used appropriately. Kizilates and Ng (2025) argue that this contradiction is not merely empirical noise but stems from a deeper methodological issue, that is the absence of context-specific, operational frameworks for assessing creativity in EFL writing, a problem that is amplified in multimodal genres such as comic writing, where no established creativity framework yet exists. This is the

study's first gap lies in a measurement and conceptual gap regarding how creativity should be defined and assessed in AI-assisted, multimodal EFL writing.

A second gap concerns where AI-assisted scaffolding has been studied. Although research on AI-assisted scaffolding has grown considerably, it remains concentrated on academic essays and general writing performance (Fathi & Rahimi, 2026; Zainab & Parveen, 2026; Zhang et al., 2025; Li & Wilson, 2025; Lin & Hwang, 2026). Comparatively little attention has been paid to multimodal creative writing tasks such as comic writing, which require learners to coordinate visual imagination, narrative development, dialogue construction, and textual coherence simultaneously. This is notable because comic-based activities have independently been shown to promote creativity and engagement in EFL learning (Rumapea et al., 2025), yet the literature offers no study examining how AI-assisted scaffolding specifically supports creativity within comic writing. The potential of AI-assisted scaffolding to foster creativity in this multimodal genre therefore remains unexplored.

A third, more conceptual gap concerns how creativity itself has been framed in this body of research. Discussions of creativity in AI-assisted writing remain largely product-oriented, evaluating the quality of the finished text, rather than attending to learners' creative experiences or the processes and learning environments through which creativity develops. This is a significant limitation because creativity is increasingly understood as the interaction of multiple dimensions rather than the property of a finished artifact alone as Rhodes' (1961) in his Four Ps framework conceptualizes creativity through the interconnected dimensions of person, process, press, and product. A study that examines only the product dimension captures only one quarter of that picture.

A fourth gap concerns Brain-Based Learning itself. Despite its recognized value for supporting cognitive and emotional engagement in learning generally (Caine & Caine, 1991; Jensen, 2008; Immordino-Yang et al., 2025; Jayasankara Reddy et al., 2021), BBL's application has remained concentrated in science, neuroscience, and health-related education. Its potential contribution to language learning, and specifically to creativity development in EFL through multimodal writing, remains scarcely investigated. More critically, no study identified in the reviewed literature has integrated Brain-Based Learning and AI-assisted

scaffolding within a single instructional framework to support creativity in comic writing.

Overall, these four gaps, the absence of a context-specific creativity framework for multimodal EFL writing, the near-total absence of AI-assisted scaffolding research in comic writing specifically, the product-only orientation of existing creativity research, and the unexplored integration of BBL with AI-assisted scaffolding, converge on a single unaddressed problem. There is a clear need for research that examines creativity beyond product outcomes by considering the interaction of process, press, and product together. Addressing this gap, the present study investigates how Brain-Based Learning and AI-assisted scaffolding can be integrated to foster creativity in comic writing, while proposing a context-sensitive set of creativity indicators grounded in fluency, flexibility, originality, and elaboration.

C. Research Question

To address this research gap, the present study investigates the integration of brain-based learning and AI-assisted scaffolding to foster creativity in comic writing. Specifically, this study seeks to answer the following research questions,

1. How does the integration of Brain-Based Learning and AI-assisted scaffolding influence students' creativity in comic writing?
2. How do students' learning experiences explain the development of creativity during the implementation of Brain-Based Learning and AI-assisted scaffolding in comic writing activities?

The first research question aimed to measure students' creativity from the product resulted, in this case is comic, using a multidimensional rubric consisting of fluency, flexibility, originality, and elaboration through its relation with BBL principles and AI Meta prompting. While the second research question will unveil students' learning experiences viewed from the process (stages and experiential learning) factors. The data displays how the integration of brain-based learning and AI assisted scaffolding influence students' creativity state analyzed through BBL principles, AI meta prompting, creativity dimensions, stages, and experiential learning in comic writing.

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D. Purpose of the Study

The purpose of this study is to investigate how the integration of Brain-Based Learning and AI-assisted scaffolding fosters students' creativity in comic writing within an EFL context, particularly in senior high school level. The study examines creativity through students' comic products by employing a multidimensional creativity framework consisting of fluency, flexibility, originality, and elaboration (Guilford, 1967) in correlation to which BBL principles (Caine & Caine, 1991) and AI meta prompting (Wang & Stojković, 2026) influence the respective dimensions and how it change students product. Through this analysis, the study seeks to understand how creativity is manifested in students' comic writing following the implementation of the instructional approach.

Furthermore, the study explores students' learning experiences to understand how creativity develops throughout the learning process. Guided by Kolb's (1984) Experiential Learning framework and stages of creativity (Wallas, 1926), the study investigates the interaction among creative process, press, and product during the implementation of Brain-Based Learning and AI-assisted scaffolding. In doing so, the study aims to provide a more holistic understanding of creativity and contribute to the development of creativity-oriented and cognitively supportive writing instruction in EFL classrooms.

E. Significance of the Study

This study is expected to contribute theoretically, pedagogically, and practically to the development of creativity-oriented English writing instruction in EFL contexts. Theoretically, the study contributes to the growing discussion on the integration of Brain-Based Learning and AI-assisted learning in language education by providing a more comprehensive understanding of how creativity can be fostered through cognitively supportive and emotionally meaningful instructional practices. While previous studies have mainly focused on the effectiveness of AI in improving writing performance and language accuracy, this study extends the discussion by examining how creativity, cognitive engagement, and authorship can be sustained during AI-assisted writing activities, particularly in multimodal writing contexts such as comic creation.

In addition, this study contributes to the literature on AI-assisted scaffolding by positioning AI not as a replacement for students' thinking processes, but as a

pedagogical scaffold that supports brainstorming, reflection, and idea development. Through this perspective, the study is expected to offer an alternative framework for integrating AI ethically and meaningfully in EFL classrooms. Furthermore, the integration of brain-based learning principles into AI-assisted writing instruction may provide new insights into how cognitive load can be managed during students' interactions with AI systems and digital learning environments.

Pedagogically, the findings of this study are expected to provide practical implications for English teachers, curriculum developers, and educators in designing creativity-oriented writing instruction that meaningfully integrates AI technologies. The study may offer instructional insights into how brain-based learning principles such as emotional engagement through patterning, relax alertness and cognitive balance can be incorporated into writing activities to support students' creativity and participation. In particular, the study may help teachers understand how AI-assisted scaffolding can be implemented in ways that maintain students' active cognitive involvement during the writing process rather than encouraging passive dependence on AI tools.

Practically, this study is also expected to benefit students by providing learning experiences that encourage creative expression, reflective thinking, and multimodal communication through narrative comic writing activities. Since comic writing requires students to integrate visual imagination, storytelling, dialogue construction, and narrative sequencing, the instructional approach explored in this study may help students develop both linguistic and creative competencies simultaneously. Moreover, by reducing unnecessary cognitive burden during AI-assisted writing activities, the integration of Brain-Based Learning principles may support students in engaging more confidently and meaningfully in the creative writing process.

The study also provides practical insights for English teachers, particularly at the senior high school level, on how AI can be used responsibly to support creative writing. The findings are expected to inform teachers on designing narrative writing instruction that reduces linguistic constraints while maintaining students' creativity. Furthermore, the use of comic-based narrative writing as a multimodal medium offers an alternative instructional strategy that may increase students' motivation, confidence, and meaningful participation in writing activities. Finally, this study is expected to serve as a useful reference for future researchers

interested in creativity, AI-assisted learning, brain-based pedagogy, multimodal writing, and EFL writing instruction in secondary education contexts.

F. Conceptual Framework

This study is grounded in the assumption that creativity in writing does not develop solely through the production of a final written product but emerges through the interaction between learners, their learning environment, the writing process, and the support provided during creative activity. Creativity can therefore be understood not only as an individual characteristic but also as a process that develops through interaction with the learning context and becomes observable in the resulting product (Rhodes, 1961). Based on this perspective, the conceptual framework illustrated in Figure 1. 1 positioned the integration of Brain-Based Learning (BBL) and AI-assisted scaffolding as a single pedagogical intervention that shapes two interrelated outcomes, students' creativity and students' learning experience, both of which converge in the students' final creative product.

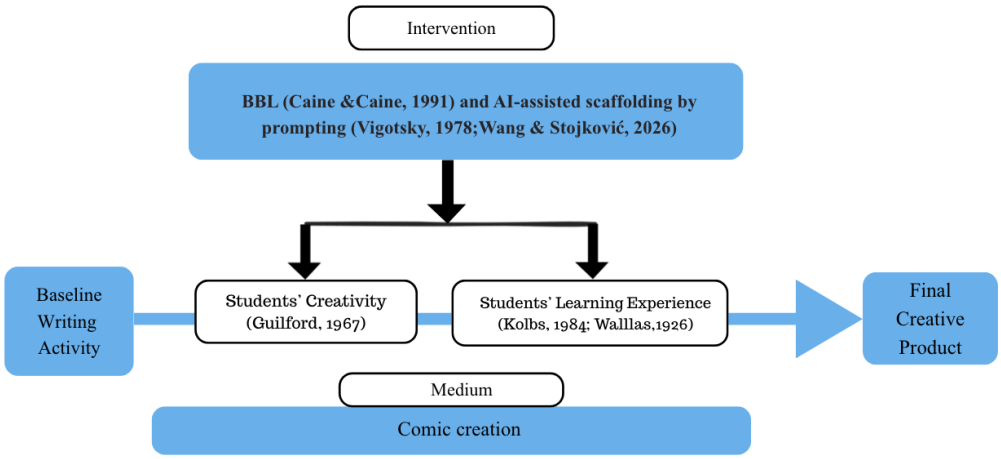


Figure 1. 1 Conceptual Framework of BBL and AI -Assisted Scaffolding Integration to Foster Creativity in Comic Writing

As shown in Figure 1.1, the framework begins with a baseline writing activity, in which students independently produce an initial narrative comic prior to the intervention. This baseline product establishes each student's starting point and provides the point of comparison against which subsequent creative change is examined. Students then proceed into the intervention itself, in which Brain-Based Learning (Caine & Caine, 1991) and AI-assisted scaffolding by prompting (Vygotsky, 1978; Wang & Stojković, 2026) are implemented together as a single,

integrated pedagogical condition rather than as two separate treatments. BBL contributes learning conditions that attend to the cognitive, emotional, social, and environmental dimensions of learning, informed by the view that learning involves the integrated functioning of the brain and body and is shaped by emotional, social, and environmental conditions. AI-assisted scaffolding, is conceptually grounded in Vygotsky's (1978) theory of the Zone of Proximal Development (ZPD), the space between what learners can accomplish independently and what they can achieve with appropriate guidance. Within this intervention, prompting functions as a form of scaffolding within the ZPD, offering targeted support when students encounter difficulties in generating ideas, exploring alternatives, developing detail, organizing their narrative, or resolving writing and visual problems. Drawing on Wang and Stojković's (2026) conceptualization of AI as a metacognitive and dialogic scaffold, this prompting is designed to encourage students to question, explore, evaluate, and reflect on their own ideas rather than to simply receive AI-generated content, so that AI functions as a thinking and dialogue partner rather than as an author, allowing students to retain ownership of their ideas and responsibility for their final creative decisions.

As Figure 1.1 illustrates, this single intervention is conceptualized as shaping two interrelated outcomes, students' creativity and students' learning experience, positioned side by side and connected to one another rather than treated as independent effects. This connection reflects the conceptual claim, following Rhodes (1961), that a creative product cannot be fully understood apart from the experience that produced it. Students' creativity is the observable outcome, while students' learning experience is the process through which that outcome is generated, and the two are treated in this framework as mutually informing rather than sequential or separate.

Students' creativity is conceptualized through four dimensions, fluency, flexibility, originality, and elaboration, rooted in the tradition of divergent thinking associated with Guilford (1967) and widely used to conceptualize and assess creative performance. Fluency concerns the ability to coherently generate multiple ideas or responses, flexibility refers to the ability to explore different categories, perspectives, or approaches, originality concerns the novelty or uniqueness of ideas, and elaboration involves developing and enriching ideas with meaningful detail.

These four dimensions are treated as interconnected aspects of students' creative performance, observed by comparing students' baseline and final comic products.

Students' learning experience is conceptualized through two complementary process perspectives, Kolb's (1984) Experiential Learning Theory and Wallas's (1926) model of the creative process. Kolb conceptualizes learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation, a perspective that helps explain how students learn through direct engagement with comic writing, reflect on their experiences, reorganize their understanding, and apply emerging ideas through subsequent revision. Wallas's model complements this by describing how students move through preparation, incubation, illumination, and verification as they develop and refine their creative ideas. Briefly, these two perspectives provide the framework's account of how students' experience of the BBL and AI-assisted scaffolding intervention unfolds as a process, rather than only as a condition they are exposed to.

Finally, as shown in the above figure, both students' creativity and students' learning experience converge in the students' final creative product, and the entire framework, from baseline activity through intervention, creativity, and learning experience, is realized through a single medium, comic creation. Comic creation is positioned in the framework not merely as the task through which the intervention is delivered, but as the medium that structurally links the framework's other elements, providing a multimodal format in which fluency, flexibility, originality, and elaboration can each be observed in both verbal and visual form, and in which students' moment-to-moment learning experience can be traced through successive panels, drafts, and revisions.

The framework therefore proposes that the integration of BBL and AI-assisted scaffolding, implemented as a single intervention grounded in Caine and Caine (1991), Vygotsky (1978), and Wang and Stojković (2026), shapes students' final creative comic product through two interrelated pathways, students' creativity as an observable outcome (Guilford, 1967) and students' learning experience as the underlying process (Kolb, 1984; Wallas, 1926). Consistent with Rhodes (1961), BBL and AI-assisted scaffolding are positioned in this framework as pedagogical supports that shape students' experiences and creative processes, rather than as direct generators of creativity, providing the conceptual basis for combining

product-based assessment of students' baseline and final comics with qualitative exploration of the learning experiences that accompanied that change.

G. Contribution of the Study

This study is expected to contribute to the field of EFL writing instruction by offering a new perspective on the integration of Brain-Based Learning and AI-assisted scaffolding in fostering students' creativity during comic writing activities. Unlike many previous studies that primarily examine AI as a tool for improving writing performance, grammar accuracy, or learning efficiency, this study contributes to the understanding of how AI can be positioned pedagogically as a scaffold that supports students' creative thinking. The study also contributes to the growing body of literature on AI-assisted learning by addressing concerns regarding students' dependency on generative AI tools and the possible decline of active cognitive engagement during writing activities. Through the integration of brain-based learning principles, this study proposes an instructional approach that not only supports creativity but also helps manage students' cognitive load during interactions with AI systems. In this regard, the study contributes to bridging the gap between educational neuroscience, creativity-oriented pedagogy, and AI-supported writing instruction in EFL contexts.

Another important contribution of this study lies in its focus on comic writing as a multimodal form of creative expression. While many previous studies on AI-assisted writing mainly focus on academic essays or conventional writing tasks, this study explores comic writing, which requires learners to integrate storytelling, dialogue construction, visual imagination, sequencing, and textual coherence simultaneously. Therefore, the study contributes to expanding the discussion of creativity in EFL writing beyond traditional text-based composition toward more multimodal and cognitively complex writing practices.

Methodologically, this study contributes by examining students' creativity through indicators such as fluency, flexibility, originality, and elaboration as reflected in their comic products before and after the implementation of the instructional approach. This may provide a more nuanced understanding of how creativity is manifested in AI-assisted writing environments. In addition, the study contributes practical insights into how emotionally supportive and cognitively

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balanced instructional practices can be designed to maintain students' active participation and creative agency during technology-assisted learning activities.

Finally, this study is expected to contribute practically to English teachers and educators, particularly at the secondary school level, by providing an alternative instructional framework for integrating AI meaningfully and responsibly in writing classrooms. The findings may help teachers design writing activities that encourage creativity, reduce excessive cognitive burden while interacting with AI technologies. Therefore, this study contributes not only to theoretical discussions on creativity and AI-assisted learning, but also to the development of more human-centered and creativity-oriented writing pedagogy in EFL education.

H. Review of Previous Study

Research on creativity-oriented writing instruction in EFL contexts has developed significantly in recent years, particularly with the emergence of AI-assisted learning technologies and multimodal writing practices. Previous studies related to the present research can generally be categorized into four major areas: (1) creativity and creative writing in EFL instruction, (2) AI-assisted writing and AI-supported scaffolding, (3) brain-based learning and cognitive engagement, and (4) comic writing and multimodal storytelling in language learning.

The first group of studies focuses on creativity and creative writing in EFL classrooms. Creativity has increasingly been viewed as an essential component of language learning because it encourages learners to express ideas fluently, flexibly, originally, and elaboratively. Mata and Gavrilut (2025) further argued that creative writing activities support learners' cognitive flexibility and idea development because students are encouraged to generate and elaborate ideas independently. However, Pardede (2025), in a systematic literature review on creative writing in Indonesian EFL contexts, found that creative writing research study were scarce, limited to university level, and mostly in poetry and short story. Studies also revealed that most previous studies still focused primarily on academic writing performance and product-based (Alzubi et al., 2025; Jabarin et al., 2025). Limited attention was given to how creativity itself was fostered during the writing process. Similarly, Prasetya and Lustyantie (2025) emphasized the inconsistency in creative writing teaching and instructional despite its prominent position. These studies indicate that creativity-oriented writing instruction is beneficial in EFL contexts.

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Nevertheless, limited studies have specifically explored how creativity can be sustained in technology-supported writing environments.

Another important area of previous research concerns the integration of artificial intelligence in EFL writing instruction. Numerous studies have reported positive impacts of AI technologies on students' writing performance, language development, and engagement. Zhao (2025), Duong and Chen (2025), and Stadnik et al., (2025) found that AI-enhanced writing tools improved students' vocabulary use, language precision, sentence construction, and writing fluency in EFL classrooms. Likewise, Tajik (2025) reported that AI-assisted writing platforms positively affected learners' motivation, confidence, and self-regulated learning experiences. Similarly, Capah et al., (2025) revealed that students perceived AI tools as useful for generating ideas, organizing content, and facilitating discussions during writing tasks. These studies suggest that AI has considerable potential to support writing instruction and assist students throughout the writing process.

Despite these benefits, several previous studies have also highlighted concerns regarding the influence of AI on students' creativity, originality, and cognitive engagement. Alzubi et al. (2025), Aslam et al. (2025), Mohammad et al. (2025) , Rofikah & Arafah (2025), and Tusino et al. (2025) found that although students viewed AI-assisted writing positively, concerns regarding dependency, originality, and critical thinking remained significant issues in AI-supported classrooms. Similarly, Mazhar and Arseven (2025) and Nhan et al. (2025) argued that excessive reliance on AI-generated content could weaken students' authentic idea generation and creative thinking processes. Bariqoh (2025) further identified risks related to cognitive dependency and homogenized writing styles when AI tools were used without sufficient pedagogical guidance. Jabarin et al. (2025) also reported that teachers expressed concerns regarding students' declining independent thinking when relying heavily on AI-generated responses. These findings indicate that while AI offers pedagogical benefits, its implementation may also create challenges related to creativity and cognitive agency. Therefore, previous studies suggest the importance of designing pedagogically controlled AI integration that maintains students' active involvement and originality during writing activities.

In response to these concerns, recent studies have increasingly discussed AI-assisted scaffolding as a way to support students' learning without replacing

their thinking processes. Aslam et al. (2025) explained that generative AI may function either as productive scaffolding or as a cognitive supporter depending on how it is implemented instructionally. Their findings showed that reflective and structured AI-supported activities helped students develop higher-order thinking and metacognitive awareness during writing tasks. Similarly, Li and Wilson (2025) found that AI-assisted scaffolding supported idea generation, language refinement, and cognitive engagement when students were guided systematically during the writing process. Lin and Hwang (2026) further demonstrated that AI-supported procedural scaffolding improved students' creative thinking and writing performance in EFL learning environments. Although these studies indicate the effectiveness of AI-assisted scaffolding, most of them focus primarily on academic essays, argumentative writing, or general writing performance. Consequently, little attention has been given to how AI-assisted scaffolding can support creativity in multimodal writing activities such as comic writing.

Sociocultural theory has long provided a theoretical foundation for understanding writing development as a mediated and socially situated process. Recent studies continue to demonstrate the relevance of Vygotsky's Zone of Proximal Development in explaining how instructional support enables learners to perform beyond their independent capabilities. In L2 writing research, ZPD-oriented studies emphasize the role of mediation, feedback, and guided interaction in supporting learners' development of complex writing skills (Panhwar et al., 2025; Sarwanti et al., 2026). Despite this theoretical emphasis, relatively few studies have explicitly examined how ZPD-based scaffolding can be operationalized through digital or AI-supported tools in creative writing contexts. Most ZPD-related research in writing focuses on teacher or peer mediation rather than technologically mediated scaffolding (Panhwar et al., 2025). This indicates a need for research that explores how contemporary learning technologies can function as mediational tools within learners' ZPD, particularly for creativity-oriented writing tasks.

Another relevant body of research concerns the application of Brain-Based Learning in language learning and technology-supported education. Brain-Based Learning emphasizes meaningful learning experiences, emotional engagement, active cognition, and cognitively balanced instructional environments. Immordino-Yang et al. (2025) emphasized that meaningful learning depends strongly on

emotional engagement and active cognitive participation. Similarly, Pengelley et al. (2025) explained that digital learning environments may unintentionally create excessive cognitive load that negatively affects learners' engagement and performance. Al-Jarf (2026) further argued that reducing cognitive load in digital learning environments may support students in producing more competent learning outcomes. In addition, Forsler and Guyard (2025) highlighted that technology-supported learning environments often create tensions related to distraction. These studies demonstrate the importance of cognitively supportive instructional approaches in technology-assisted learning environments. However, limited studies have specifically integrated Brain-Based Learning principles into AI-assisted writing instruction, particularly in relation to creativity and multimodal writing activities.

The final group of studies relates to comic writing and digital storytelling in EFL instruction. Comic writing and multimodal storytelling have been increasingly recognized as effective instructional approaches because they encourage learners to integrate visual and verbal modes of communication simultaneously. Rumapea et al. (2025) found that comic-strip-based writing activities improved students' narrative development, creativity, coherence, and engagement during English writing tasks. Compagnoni (2025) further explained that AI-assisted storytelling environments could support experimentation and self-expression when implemented through meaningful pedagogical practices. These studies suggest that multimodal storytelling activities provide valuable opportunities for fostering creativity and engagement in language learning. Nevertheless, studies specifically investigating the integration of Brain-Based Learning and AI-assisted scaffolding in narrative comic writing remain very limited.

Based on the previous studies above, it can be seen that research on AI-assisted writing, creativity, Brain-Based Learning, and comic writing has developed considerably in EFL education. However, several important gaps remain. First, most previous studies primarily focus on writing performance, language accuracy, and learner motivation rather than examining how students' creativity and authorship can be maintained during AI-assisted writing activities. Second, although AI-assisted scaffolding has shown positive effects on learning, limited studies have explored its implementation in multimodal creative writing contexts such as comic writing. Third, research integrating Brain-Based Learning principles

with AI-assisted writing instruction remains underexplored, particularly regarding cognitive load management and creative engagement during AI-supported learning activities. Therefore, the present study attempts to address these gaps by investigating how the integration of Brain-Based Learning and AI-assisted scaffolding influences students' creativity in comic writing within EFL secondary classrooms.

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