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Article

Integrating Generative AI for Enhancing Students' L2 Writing Literacy in a Bilingual Program

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Abstract

The application of Generative Artificial Intelligence (GAI) tools has become increasingly prevalent in fostering L2 writing proficiency within bilingual education programmes. By providing immediate feedback and tailored support, GAI reshapes the writing process, offering novel opportunities for skill development while simultaneously raising issues regarding ethical use and potential dependency. The purpose of this study is to examine the contribution of GAI to the enhancement of L2 writing proficiency, to analyse its pedagogical integration in bilingual classrooms, and to highlight both the opportunities and challenges associated with its use in such educational contexts. A qualitative systematic review of the literature was undertaken, drawing on peer-reviewed studies published after 2020 and sourced from databases including JSTOR, Web of Science, and Google Scholar. The selection process followed the PRISMA framework to ensure rigour and reliability. Findings suggest that GAI tools play a significant role in improving L2 writing proficiency by delivering personalised guidance and fostering learner engagement. However, concerns persist regarding excessive reliance on these tools, issues of academic integrity, and the importance of employing balanced pedagogical strategies to achieve effective integration. GAI demonstrates considerable potential for advancing L2 writing proficiency within bilingual education. Nonetheless, its integration must be carefully managed to mitigate ethical risks, reduce dependency, and ensure that AI serves as a complement to, rather than a replacement for, conventional instructional approaches.

Keywords

Generative Artificial Intelligence (GAI), L2 Writing Proficiency, Bilingual Education, Pedagogical Integration, Ethical Use in Language Learning.

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Introduction

GAI has become a disruptive technology in supporting L2 writing proficiency because it offers immediate and individualised responses. [Lu and Ba \(2025\)](#) found that feedback generated through GAI significantly enhances learner engagement and performance, particularly in inquiry-based writing tasks. Such mechanisms provide personalised guidance for improvement, thereby encouraging greater learner involvement. However, [Kalantzis and Cope \(2025\)](#) argue that the role of GAI extends beyond grammar and syntax, as it also fosters multimodal literacy that integrates textual and visual communication, creativity, and critical thinking, all of which are essential competences for L2 learners.

Bilingual programmes remain vital in modern classrooms since they immerse learners in two languages, promoting cross-linguistic awareness and flexible cognitive development. [Lin et al. \(2025\)](#) highlight that the use of GAI in classrooms is particularly beneficial in multicultural settings where students may face challenges linked to their linguistic backgrounds. By offering multilingual support, AI tools enable students to overcome language barriers and strengthen writing proficiency in both their L1 and L2. Conversely, [Lee and Cho \(2025\)](#) emphasise that while GAI supports engagement and writing in L2 contexts, adopting a blended model that integrates digital resources with conventional teaching strategies is crucial. This dual approach prevents over-reliance on AI and encourages learners to cultivate additional skills such as critical thinking and independent writing.

As AI becomes increasingly integrated into education, its role in enhancing L2 literacy extends across both productive (writing and speaking) and receptive (reading and listening) domains. [Davoodifard and Eskin \(2024\)](#) explain that GAI reduces the challenges educators face in personalising learning experiences and assessing performance. Nevertheless, [Kizilcec et al. \(2024\)](#) caution that AI may disrupt established assessment systems, particularly with regard to academic integrity and the reliability of feedback. While GAI provides immediate responses, the changing role of AI in student outcomes necessitates adjustments in assessment strategies to maintain validity and fairness. Although GAI holds considerable potential for developing writing proficiency, its integration must be carefully managed. [Lu and Ba \(2025\)](#) stress that feedback functions in GAI require close monitoring to ensure they supplement, rather than obstruct, the learning process. Similarly, [Kalantzis and Cope \(2025\)](#) argue that effective pedagogical integration of GAI calls for broader paradigm shifts, preparing educators to incorporate AI in ways that support learning without undermining student agency.

The advancement of L2 writing in bilingual settings often remains inadequate, particularly when L1 and L2 differ significantly in linguistic structure. [Mayer and Trezek \(2023\)](#) draw attention to the challenges faced by deaf learners in bilingual contexts, where mismatches between sign and spoken languages impede L2 writing development. This issue underscores the need for further exploration of cross-linguistic transfer and its optimisation for writing, as current studies typically focus on isolated language components rather than adopting a holistic perspective. Furthermore, research into the use of GAI for enhancing L2 writing is still limited. [Shafie, Aiyub and Najmi \(2024\)](#) note that while tools such as ChatGPT can support specific writing tasks, such as composing business emails, little evidence exists regarding their role in dual-language learning. Further investigation is required to determine effective strategies for employing AI in bilingual instruction and to address the ethical considerations associated with its use.

Research Objectives

- Analyse the influence of Generative AI tools on the development of L2 writing literacy within bilingual programmes.
- Explore how Generative AI supports pedagogical practices for L2 writing in dual-language contexts.
- Determine the opportunities and challenges associated with integrating Generative AI into bilingual programmes for L2 writing instruction.

The study underscores the transformative capacity of GAI in advancing L2 writing proficiency within bilingual programmes. Tools such as ChatGPT provide personalised, real-time support that enables both students and teachers to address writing-related challenges more effectively. Nevertheless, [Lee-Price \(2024\)](#) cautions that ethical and pedagogical concerns must be carefully managed to fully harness the benefits of GAI in academic writing practices. This research is significant because it demonstrates the potential of GAI to reshape L2 writing instruction in bilingual contexts. According to [Kong, Lee and Tsang \(2024\)](#), GAI tools promote self-regulated learning in academic writing by guiding learners through the six stages of planning, prompting, previewing,

producing, peer-reviewing, and progress tracking. This 6-P model offers both structure and flexibility, making it highly relevant to the development of essential writing skills among L2 learners in bilingual settings. The study also stresses that pedagogical frameworks must account for both the strengths and limitations of AI when cultivating learners' identities as autonomous writers. Furthermore, [Maphoto et al. \(2024\)](#) highlight how GAI can expand writing pathways in distance learning by offering innovative tools that support education across diverse environments. Beyond contributing to pedagogical approaches, the study also has implications for educational policy, as it illustrates how AI can be integrated responsibly and productively into teaching and learning processes.

Literature Review

Generative AI Tools on L2 Writing Literacy Development in the Bilingual Program

The development of L2 writing proficiency is being reshaped by the integration of GAI tools into bilingual programmes, which provide adaptive, real-time assistance. [Mi, Rong and Chen \(2025\)](#) demonstrated that feedback produced through GAI, when combined with peer review, enhances metacognitive awareness among L2 writers and improves both structural and lexical precision. Despite these benefits, concerns remain regarding superficial revisions and over-reliance on the technology. On the ethical and institutional level, [Dang and Wang \(2024\)](#) examined AI-related policies at U.S. universities, emphasising the importance of incorporating GAI responsibly into writing instruction in order to support linguistically diverse L2 learners and fulfil institutional obligations.

Learner engagement and motivation are also central to the use of GAI in literacy development. [Stornaiuolo et al. \(2024\)](#) found that GAI tools stimulate creativity and enjoyment in digital writing, extending learners' participation in writing activities within bilingual settings. Nevertheless, the potential for dependency highlights the necessity of critical digital literacy skills to moderate such engagement. From a learner-centred perspective, [Kohnke, Zou and Su \(2025\)](#) reported that while L2 learners valued the personalised learning opportunities offered by GAI, they also expressed concerns about accuracy and pedagogical limitations in AI-generated content. This tension reinforces the importance of teacher mediation within bilingual contexts. The application of GAI has also been examined in formal academic environments. [Wang and Ren \(2024\)](#) empirically demonstrated that GAI-supported writing improved coherence, organisation, and academic tone among students in a linguistics course in Hong Kong. However, the extent of these benefits varied depending on learners' initial skill levels. Similarly, [Frenzke–Shim et al. \(2024\)](#) noted that cognition-adaptive GAI, combined with feedback tailored to cognitive load, could enhance textual comprehension and production for L2 learners, particularly those engaged in dual-language acquisition.

Pedagogical implications also emerge when GAI functions as a conversational partner. [Joo \(2024\)](#) observed that GAI can facilitate formative assessment by serving as a writing or speaking partner, providing scaffolded interaction through simulated conversations. This function is especially valuable in bilingual education, where L2 use must be encouraged in natural contexts. [Smith et al. \(2025\)](#) further analysed preservice teachers' use of GAI in multimodal composition, finding that while it improved writing fluency, it also raised concerns regarding authorship and originality, issues that require explicit guidance for students. At a broader level, [Alaqlobi et al. \(2025\)](#) employed a SWOT analysis in applied linguistics, highlighting the strengths of GAI such as immediate feedback and increased learner autonomy, while warning against academic dishonesty and the erosion of personal writing voice. Complementing these findings, [McCallum \(2024\)](#) showed that GAI can be effectively applied in telecollaborative bilingual activities to promote intercultural communicative competence, thereby extending its relevance to multilingual educational contexts.

Role of Generative AI in Supporting L2 Writing Pedagogy in Dual Language Settings

The incorporation of GAI tools has also become increasingly evident in the teaching of L2 writing, particularly within dual-language contexts. [Sénécal \(2024\)](#) highlights the wide range of affordances that GAI offers for strengthening L2 learning and observes that automated platforms such as ChatGPT can enhance both writing and reading comprehension. However, this potential is accompanied by concerns over academic integrity. Similarly, [Xiao, Zhu and Xin \(2025\)](#) emphasise the transformative role of ChatGPT in supporting the teaching and learning of EFL, while also warning of risks associated with excessive dependence on the technology and a consequent decline in learners' critical thinking during writing tasks.

The contribution of AI to fostering multimodal writing in dual-language settings has been examined by Lin et al. (2025), who investigated the integration of GAI in multicultural classrooms. Their findings indicate that AI not only assists students in improving their writing skills but also cultivates collaboration and stimulates critical thinking and content creation across multiple languages, which is essential in dual-language education. At the same time, Asad et al. (2024) adopt a more cautious perspective on the pedagogical use of ChatGPT. They recognise its value in providing individualised feedback and supporting multimedia design but also note the challenges associated with diminished student creativity and the ethical implications of AI in education. Han (2025) echoes this view, stressing the importance of balancing AI-assisted learning with human autonomy. He proposes a co-creative learning model in which AI is integrated into conventional teaching practices, thereby preserving learners' originality and critical thinking in academic writing.

Redmann (2024) explores the benefits of combining genre-based pedagogy with GAI to familiarise L2 learners with linguistic text structures. In parallel, Mortensen (2024) highlight the necessity of professional development for language teachers to effectively incorporate GAI into their classrooms. They argue that teacher training significantly enriches pedagogical practices and enhances the successful integration of AI into L2 learning. Barrot (2024) contributes both theoretical and practical insights into embedding ChatGPT within the writing classroom, illustrating its potential applications across various stages of the writing process. His work also acknowledges the capacity of AI to facilitate collaborative writing through preparation, planning, and revision, while at the same time drawing attention to the risk that an overemphasis on AI could overshadow critical pedagogical principles and compromise the integrity of writing instruction.

Challenges and Opportunities of Implementing GAI in the Bilingual Program for L2 Writing

The opportunities and challenges associated with integrating GAI into bilingual education for L2 writing are becoming increasingly prominent across diverse educational settings. Taeihagh (2025) emphasises that governance is a central concern, with regulatory structures and ethical considerations playing a decisive role. Within bilingual contexts, where cross-lingual backgrounds are the norm, policies that guarantee privacy, transparency, and fairness are especially vital. These governance factors can either obstruct or facilitate the use of AI tools, depending on how such systems are designed, the ethical frameworks surrounding them, and their adaptability to multilingual learning environments.

Moy and Feldstein (2024) similarly contend that universities must both embrace opportunities and confront the difficulties posed by GAI, particularly in relation to personalised learning. Within bilingual programmes, GAI can enrich language acquisition by generating targeted writing support and tailored resources. Yet its moral implications remain contested, most notably with regard to academic integrity, as reliance on AI-produced work risks diminishing students' writing competence. Cummings, Monroe and Watkins (2024) examine the worldwide transformation of first-year writing programmes shaped by GAI, characterised by immediate feedback and iterative revisions. Such technology is particularly beneficial for L2 learners in bilingual education, where issues of language transfer between L1 and L2 frequently arise. Nonetheless, they caution that limitations in AI reliability can lead to misinterpretations of feedback or encourage overuse, thereby impeding students' development as independent writers.

The evaluation of GAI tools within bilingual education is also a key issue. Ramamoorthy (2025) highlights the difficulty of measuring their effectiveness in foreign language instruction, particularly where learners' language proficiencies vary. Ensuring that AI feedback remains both precise and relevant to all learners is essential, yet the subjective and context-dependent nature of bilingual writing complicates this assessment further. From a practical perspective, Foote et al. (2025) outline how AI can advance both educational and clinical research, offering valuable support for developing the academic writing skills of L2 learners. By automating administrative processes and delivering focused feedback, AI can lessen teachers' workload and enhance instructional effectiveness.

Khlaif et al. (2025) explore the redesign of assessments in the era of AI-supported learning, underlining the importance of frameworks that integrate AI into evaluation practices. This issue is particularly significant for bilingual L2 writing, where assessment design must reflect differing language systems and proficiency levels. While AI promises greater grading accuracy and individualised feedback, it simultaneously raises questions of equitable access, especially for students from minority language groups. Pu (2024) provides further insight into practical applications by documenting the use of GAI in restructuring coursework in Data Structures and

Algorithms. Although drawn from computer science, the principles of AI-assisted academic work, such as writing and problem-solving, are transferable to bilingual education. Finally, [Mortensen \(2024\)](#) warns that although AI tools can deliver considerable efficiency and process optimisation, their role in education must be carefully managed. In bilingual L2 writing programmes, excessive dependence on automated feedback or breaches of academic integrity are genuine risks. To address this, structures must be developed that balance opportunity with responsibility, ensuring that AI strengthens learning without undermining learners' independence or ethical standards in writing.

Literature Gap

The body of scholarship on GAI within bilingual L2 writing contexts remains incomplete, with significant areas still requiring investigation. [Taeihagh \(2025\)](#) points to governance issues as central to the integration of GAI, yet little attention has been devoted to how such concerns manifest in multicultural and multilingual classrooms, where varied linguistic repertoires may shape the technology's effectiveness. Ethical dimensions also demand closer scrutiny, as [Moy and Feldstein \(2024\)](#) emphasise the influence of AI-generated content on learners' autonomy and academic honesty, matters that hold particular weight in bilingual environments. Although [Cummings et al. \(2024\)](#) acknowledge the potential of GAI to deliver individualised feedback, they overlook its capacity to accommodate the full range of learner proficiency levels typically encountered in bilingual programmes. [Ramamoorthy \(2025\)](#) likewise notes that evaluating AI performance remains underdeveloped, a challenge intensified in bilingual education where uneven skill levels complicate judgements about the precision and value of AI-generated responses.

Methodology

Research Methods and Design

This study adopted a qualitative research design, applying the Systematic Literature Review (SLR) method to achieve its objectives. The choice of SLR was driven by its capacity to provide a structured and comprehensive exploration of existing scholarship, which is essential for clarifying how Generative AI (GenAI) contributes to L2 writing literacy and how it may be effectively embedded within bilingual education programmes. The review process involved applying inclusion and exclusion criteria, identifying relevant publications, and critically evaluating the quality of evidence presented. The overarching aim of the SLR was to synthesise findings from diverse peer-reviewed sources, thereby generating a consolidated perspective on both the opportunities and challenges associated with integrating GenAI into L2 writing pedagogy.

Data Collection Methods

Searching Techniques

The literature search was conducted using a carefully selected group of keywords aligned with the central themes of the investigation. Terms including "Generative AI," "L2 writing literacy," "bilingual programmes," and "pedagogical strategies" were employed across multiple academic databases to retrieve relevant studies. The choice of these search terms was deliberately refined to correspond with the study's objectives, allowing the review process to remain focused and ensuring that only sources directly related to the research aims were included.

Databases

The literature search was carried out using a range of established academic databases to ensure a comprehensive collection of peer-reviewed sources. The selected platforms included JSTOR, Web of Science (WOS), Google Scholar, ResearchGate, and ERIC. These databases were chosen because of their extensive coverage of high-quality publications in the areas of educational technology and language learning, making them particularly suitable for identifying studies relevant to the research focus.

Boolean Operators

To sharpen the scope of the literature search, Boolean operators were systematically applied to connect and filter the keywords. Logical connectors such as AND, OR, and NOT were utilised to improve both precision and relevance in the results. For instance, a query such as "Generative AI AND L2 writing literacy AND bilingual

programmes” was designed to yield studies addressing all three core themes simultaneously. Conversely, a string like “Generative AI AND L2 writing NOT pedagogy” was employed to eliminate studies that focused exclusively on pedagogical aspects without addressing the wider research objectives.

Inclusion and Exclusion Criteria

Table 1 presents the inclusion and exclusion parameters that were applied to guide the selection of studies for this review.

Table 1: Inclusion and Exclusion Criteria.

Criteria	Inclusion	Exclusion
Publications	Peer-reviewed journal articles and conference proceedings published from 2020 onwards	Non-peer-reviewed sources (e.g., blogs, editorials, opinion pieces) and works published prior to 2020
Research Type	Empirical investigations, systematic reviews, and case study research	Commentary-based papers and non-systematic narrative reviews
Language	Studies published in English	Publications in languages other than English
Focus	Research addressing the role of Generative AI in L2 writing literacy within bilingual educational contexts	Studies unrelated to Generative AI, L2 writing, or bilingual programme settings

Selection of Papers through the PRISMA Framework

An initial pool of 100 articles was subjected to screening based on the predetermined inclusion and exclusion criteria. Abstracts were examined to assess their relevance to the research focus. Following this stage, 10 studies were shortlisted for in-depth analysis. A purposive sampling strategy was employed, ensuring that only publications directly aligned with the research objectives were retained. The screening process adhered to the PRISMA framework, which provided transparency and a structured procedure. The full texts of the selected studies were subsequently reviewed multiple times to confirm their suitability for addressing the aims of the study (Figure 1).

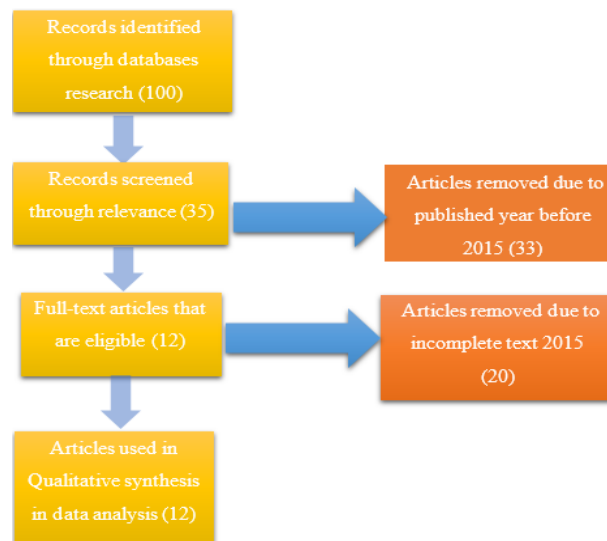


Figure 1: PRISMA Framework.

Data Analysis Methods

The data extracted from the selected studies were examined through Thematic Analysis, a qualitative research method that facilitates the identification, interpretation, and reporting of recurring patterns or themes across the dataset. Table 2 provides a structured outline of the sequential stages followed during the thematic analysis process.

Table 2: Data Analysis Methods.

Step	Description
Step 1: Familiarization	The researcher engaged in an in-depth reading of the selected studies, recording initial observations and noting recurring concepts and patterns.
Step 2: Coding	Relevant data concerning the role of Generative AI in L2 writing within bilingual contexts were extracted, and preliminary codes were systematically assigned.
Step 3: Theme Identification	The preliminary codes were analysed to uncover broader thematic categories aligned with the study's objectives, such as opportunities, challenges, and strategies for integration.
Step 4: Reviewing Themes	The identified themes were scrutinised and adjusted to ensure they accurately represented the central issues regarding Generative AI in L2 writing literacy across bilingual settings.
Step 5: Defining and Naming Themes	Each theme was clearly articulated and labelled, ensuring precision and direct relevance to the research questions, with sub-themes established where appropriate.
Step 6: Writing the Report	A detailed account was composed, integrating the themes and sub-themes, which addressed the research aims and highlighted existing gaps within the literature.

Ethical Considerations

This research was carried out in adherence to ethical standards, with all secondary data sources drawn from peer-reviewed literature appropriately cited and referenced. The adoption of the PRISMA framework ensured transparency in both the selection and analytical stages, thereby reducing the likelihood of bias. Ethical concerns were carefully addressed to safeguard the credibility, precision, and trustworthiness of the findings.

Results

This section organises the study's findings in tabular format and links them to the corresponding research objectives. [Table 3](#) summarises the themes identified through data analysis, which were derived using NVivo software to process and interpret the selected material. [Table 3](#) outlines the principal themes associated with incorporating Generative AI into bilingual L2 writing contexts. The themes demonstrate how AI tools contribute to the development of writing proficiency by offering personalised feedback (Generative AI Tools for L2 Writing Literacy), while also reinforcing pedagogical practices within dual-language classrooms (Pedagogical Integration). At the same time, the table reflects challenges such as ethical considerations and technological limitations (Challenges in Implementing Generative AI). It further identifies opportunities for fostering learner engagement and independence (Opportunities of Generative AI) and underscores the pivotal function of educators in guiding and regulating the use of AI in instructional settings (Educators' Role).

Table 3: Theme Extracted.

Theme	Description
Generative AI Tools for L2 Writing Literacy	Explores how Generative AI applications enhance L2 writing within bilingual contexts by delivering customised feedback and refining learners' writing performance.
Pedagogical Integration of Generative AI in Dual Language Settings	Examines the contribution of Generative AI to L2 pedagogy in dual language programmes, supporting teachers in applying effective instructional methods.
Challenges in Implementing Generative AI in Bilingual Programs	Investigates the obstacles to integrating Generative AI in bilingual education, including technological limitations, ethical dilemmas, and instructional concerns.
Opportunities of Generative AI in Bilingual L2 Writing	Identifies the potential benefits of employing Generative AI in bilingual settings, such as fostering engagement, advancing writing competence, and promoting learner independence.
Ethical and Equity Issues in AI Use for Writing	Discusses ethical risks linked to Generative AI, including plagiarism, excessive reliance, and fairness in access across multilingual student populations.
Educators' Role in Managing AI Integration in Writing Instruction	Emphasises the pivotal role of educators in regulating AI use for L2 writing instruction, ensuring that AI complements rather than substitutes core pedagogical practices.

Theme 1: Generative AI Tools for L2 Writing Literacy

Table 4 presents the Generative AI tools associated with L2 writing literacy, specifically focusing on their relevance to L2 learners and their application within bilingual programmes. Both investigations underscore the dual nature of Generative AI tools in advancing L2 writing literacy. Cummings et al. (2024) observed that although such tools support processes like idea generation and text refinement, they may also reduce learner autonomy and weaken individual expression. In a similar vein, Li and Balinas (2025) reported that AI contributes positively to the development of writing proficiency but warned that excessive dependence could impede critical thinking skills. Collectively, these studies recommend a balanced pedagogical approach to incorporating AI within instructional settings (Table 4).

Table 4: Generative AI Tools for L2 Writing Literacy.

Authors	Objectives	Methods	Findings	Conclusion
Cummings et al. (2024)	Investigate the application of Generative AI in first-year writing courses, with particular attention to its benefits and limitations in L2 literacy development.	Mixed-method empirical study combining qualitative and quantitative approaches.	Generative AI tools assisted learners with idea generation, structuring counterarguments, and revising drafts. Nonetheless, students reported issues of inefficiency and unreliability.	The study concludes that although AI can strengthen writing support, it may compromise student voice and autonomy, requiring educators to integrate AI cautiously and facilitate reflective practice.
Li and Balinas (2025)	Examine the role of Generative AI in improving university students' information literacy and academic writing performance.	Systematic literature review supported by thematic analysis.	Findings indicate that Generative AI enhances research practices and strengthens academic writing processes. Yet, dependence on these tools risks undermining learners' critical thinking capacities.	The study highlights the necessity of a balanced approach where AI complements but does not replace the cultivation of analytical and evaluative skills.

Theme 2: Pedagogical Integration of Generative AI in Dual Language Settings

Table 5 illustrates the significance of embedding Generative AI within pedagogical practices in dual-language learning environments. Both studies examine the role of Generative AI in supporting L2 writing within dual-language contexts. Joo (2024) highlights that such tools can deliver immediate feedback and personalised evaluations, which may enhance both writing and oral proficiency. In contrast, Yan (2023) demonstrates that while ChatGPT contributes to greater writing fluency, it simultaneously raises issues related to academic honesty. Collectively, these findings emphasise the necessity of deliberate and well-informed adoption of AI, underscoring the value of fostering AI literacy to guide L2 learners toward responsible and innovative applications (Table 5).

Table 5: Pedagogical Integration of Generative AI in Dual Language Settings.

Authors	Objectives	Methods	Findings	Conclusion
Joo (2024)	Investigate the role of Generative AI as interactive writing and speaking partners in L2 learning, emphasising implications for assessment.	Literature review combined with conceptual framework analysis.	AI-powered writing and speaking partners deliver immediate feedback and tailored assessments, enhancing learners' proficiency in both written and oral L2 tasks.	While Generative AI provides meaningful educational opportunities, its application in assessment contexts must be carefully managed to prioritise learning-focused outcomes.
Yan (2023)	Assess the influence of ChatGPT on L2 writing learners within a practicum, examining both advantages and potential drawbacks.	Qualitative case study utilising triangulated data from learner reflections and behavioural observations.	ChatGPT improved learners' writing fluency and efficiency, yet raised concerns regarding academic integrity, highlighting the need for regulatory guidance.	Recommends integrating AI literacy instruction to ensure learners use AI ethically, fostering creativity while maintaining responsible and informed application of AI tools.

Theme 3: Challenges in Implementing Generative AI in Bilingual Programs

Table 6 presents the principal challenges associated with the implementation of Generative AI within bilingual education programmes. Both studies underscore significant obstacles to the adoption of Generative AI in bilingual education. Taciagh (2025) identified ethical challenges such as algorithmic bias, data privacy risks, and governance complexities, which become particularly pronounced in multilingual environments. Likewise, Spector-Bagdady (2023) reported difficulties related to data integration, cultural bias, and ethical implications of AI-generated outputs within bilingual instructional settings. Collectively, these studies emphasise the necessity of establishing ethical frameworks and regulatory guidelines to promote fairness, transparency, and responsible application of AI in educational contexts (Table 6).

Table 6: Challenges in Implementing Generative AI in Bilingual Programs.

Authors	Objectives	Methods	Findings	Conclusion
Taciagh (2025)	To investigate governance and regulatory challenges posed by Generative AI, with a particular focus on multilingual and bilingual educational contexts.	Conceptual analysis complemented by literature review.	Identified major ethical challenges for Generative AI, including systemic biases, privacy risks, and governance complexities, which are accentuated in multilingual settings.	Highlights the critical need for robust ethical frameworks and policy guidelines to govern AI deployment in bilingual educational programs.
Spector-Bagdady (2023)	To explore the ethical ramifications of Generative AI within data-intensive fields, with attention to bilingual education contexts.	Literature review with qualitative synthesis.	Revealed that AI applications in bilingual programs face issues in data integration, cultural bias, and ethical concerns surrounding AI-generated outputs.	Recommends the creation of ethical AI development and implementation frameworks to ensure fairness, accountability, and transparency, especially in multilingual learning environments.

Theme 4: Opportunities of Generative AI in Bilingual L2 Writing

Table 7 presents the potential opportunities offered by Generative AI for enhancing bilingual L2 writing practices. Both studies underscore the dual aspects of opportunities and challenges associated with the application of Generative AI in bilingual L2 writing. Moy and Feldstein (2024) observed that such tools can increase student motivation and foster academic collaboration, but they also stressed the necessity of adhering to ethical standards. Similarly, Sylvia IV and Reeves (2024) reported that AI can support the advancement of writing proficiency, particularly by strengthening fluency and the generation of ideas, yet they cautioned about questions of authorship and emphasised the need for further inquiry into the ethical dimensions of AI use in higher education (Table 7).

Table 7: Opportunities of Generative AI in Bilingual L2 Writing.

Authors	Objectives	Methods	Findings	Conclusion
Moy and Feldstein (2024)	To investigate both the prospects and challenges of Generative AI in higher education, with particular attention to its effect on student engagement.	Longitudinal surveys combined with workshops at AI Institutes.	Found that Generative AI can boost student engagement by providing tailored learning experiences, enhancing research efficiency, and supporting collaborative academic work.	Concludes that while Generative AI offers significant benefits for student engagement and learning, its implementation must be guided by explicit ethical standards and the promotion of AI literacy.
Sylvia IV and Reeves (2024)	To assess the influence of Generative AI tools on academic writing proficiency and their role in supporting students' writing processes.	Analytical review of AI tool applications in academic contexts.	Determined that AI tools enhance writing proficiency by improving fluency, facilitating idea generation, and supporting brainstorming; nonetheless, challenges persist regarding reliability and authorship attribution.	Suggests that Generative AI can strengthen student autonomy and writing skills, but further research is required to safeguard ethical use and uphold academic integrity.

Theme 5: Ethical and Equity Issues in AI Use for Writing

Table 8 outlines the ethical and equity-related concerns linked to the use of AI in writing practices. Both studies emphasise the ethical challenges linked to the adoption of Generative AI in academic writing. Ajiye and Omokhabi (2025) identified concerns including questions of authorship, risks of plagiarism, and a potential decline in learners' critical thinking when relying on AI systems. In a similar vein, Donnell, Porter and Fitzgerald (2024) acknowledged the advantages of AI in enhancing learning efficiency but cautioned that it may also foster dependency, create equity-related issues, and highlight the pressing need for clearer ethical guidelines. Collectively, these studies underline the necessity of embedding ethical considerations into the integration of AI within academic contexts (Table 8).

Table 8: Ethical and Equity Issues in AI Use for Writing.

Authors	Objectives	Methods	Findings	Conclusion
Ajiye and Omokhabi (2025)	To examine the ethical implications of AI-assisted tools in academic writing and their impact on maintaining academic integrity.	Comprehensive literature review and analytical synthesis.	Identified that while Generative AI accelerates academic writing, it raises concerns regarding authorship attribution, plagiarism, and potential reductions in students' critical thinking capacity.	Recommends the responsible use of AI that preserves human creativity and intellectual integrity while leveraging AI's advantages.
Donnell et al. (2024)	To investigate ethical challenges in employing AI within higher education, particularly regarding academic integrity, equity, and learner dependency.	Qualitative approach involving interviews and surveys.	Revealed that students experience increased learning efficiency but expressed concerns about over-reliance on AI, insufficient ethical guidelines, and unequal access to AI tools.	Highlights the necessity of well-defined institutional policies to promote equitable and ethically responsible AI use in educational contexts.

Theme 6: Educators' Role in Managing AI Integration in Writing Instruction

Table 9 presents the critical function of educators in embedding AI within writing instruction, emphasising their role in guiding, moderating, and contextualising its use in pedagogical practice. Both studies underscore the indispensable role of educators in embedding AI within L2 writing pedagogy. Yao et al. (2025) highlighted that AI chatbots, such as Kimi, can deliver tailored feedback, yet their outputs differ significantly from teacher-provided responses, pointing to the irreplaceable nuance of human judgement. Similarly, Aladini et al. (2025) demonstrated that AI-assisted writing tasks enhance learners' writing proficiency and foster self-regulation, but stressed that the presence of educators is central to cultivating critical thinking and ensuring that AI technologies are harnessed productively within the instructional process (Table 9).

Table 9: Educators' Role in Managing AI Integration in Writing Instruction.

Authors	Objectives	Methods	Findings	Conclusion
Yao et al. (2025)	To investigate the integration of AI-enabled chatbots in delivering feedback for L2 writing instruction.	Qualitative study guided by Activity Theory.	AI chatbots, such as Kimi, supplement teacher feedback by providing timely, tailored support, although discrepancies exist between AI and human feedback.	AI can effectively assist in L2 writing feedback, yet teacher mediation remains essential to ensure alignment with instructional objectives and maximise learning outcomes.
Aladini et al. (2025)	To examine the effects of self-directed AI tasks on L2 writing development and the mediating role of educators.	Quasi-experimental study complemented by interviews.	AI-facilitated tasks improved students' writing abilities and self-regulatory skills, with educators guiding reflection on AI outputs to enhance learning.	While AI can boost L2 writing competence, the presence and guidance of educators are critical to cultivate critical thinking and ensure that technology is used effectively.

Discussion

Interpretation of the Findings

Role of Generative AI Tools on L2 Writing Literacy in the Bilingual Program

The findings indicate a pressing necessity to integrate GAI tools into the advancement of L2 writing within bilingual programmes. Applications such as ChatGPT offer prompt, personalised feedback, which has been shown to enhance learners' writing abilities and stimulate greater motivation among bilingual students (Cummings et al., 2024). These tools are applicable to a range of tasks, including idea generation and revision. However, concerns have also emerged regarding excessive reliance on such systems and the variability in the reliability of the feedback produced (Taeihagh, 2025). Ethical dimensions, particularly questions of authorship and academic integrity, were likewise identified, underscoring the essential role of educators in guiding learners towards independent writing development (Spector-Bagdady, 2023).

Role of Generative AI in Supporting L2 Writing Pedagogy in Dual Language Settings

GAI tools contribute to the advancement of L2 writing pedagogy in bilingual contexts by supporting multimodal composition and encouraging purposeful communication (Yan, 2023). Acting as writing partners, these systems facilitate collaborative learning by providing timely feedback, which can accelerate knowledge exchange among learners (Joo, 2024). Despite these advantages, the findings underscore the necessity of adopting AI in a measured way to prevent overdependence, with teachers remaining central to mediating its application in classrooms (Lee-Price, 2024). While AI has the capacity to enhance fluency and improve written expression, concerns persist that its use may diminish learners' critical thinking skills if not carefully managed. Hence, educators must safeguard ethical practices and guide students towards responsible engagement with AI in academic writing (Kohnke et al., 2025).

Challenges and Opportunities of Implementing GAI in the Bilingual Program for L2 Writing

The incorporation of GAI into bilingual education brings both opportunities and challenges. On the positive side, it enables the provision of personalised feedback, strengthens learners' writing proficiency, and supports the development of self-regulated learning practices (Sylvia IV & Reeves, 2024). However, concerns regarding governance remain, particularly issues of bias, data protection, and the potential for academic misconduct (Taeihagh, 2025). Questions of equity in access to AI technologies also arise, especially within multilingual learning environments where disparities may be more pronounced (Spector-Bagdady, 2023). These findings highlight the necessity for robust institutional frameworks and ethical policies that encourage responsible adoption of AI while addressing risks to fairness and integrity (Ajiye & Omokhabi, 2025).

Comparison with the Previous Studies

This study explores the potential of GAI in advancing L2 writing literacy within bilingual systems, extending earlier scholarship by offering nuanced insights into its pedagogical integration, associated challenges, and ethical considerations. The findings reinforce and extend those of Cummings et al. (2024) and Li and Balinas (2025), who reported that tools such as ChatGPT are effective in enhancing fluency and textual organisation by providing learners with targeted feedback. At the same time, this study supports the cautionary perspective of Taeihagh (2025), who warned against the dangers of excessive dependence on AI, including weakened critical thinking and uncertainties regarding authorship. These concerns also resonate with the arguments of Spector-Bagdady (2023), who examined threats to academic integrity. The current results therefore underscore the essential role of educators in mediating AI use, ensuring that students cultivate independence in writing and critically evaluate AI-generated material.

The pedagogical role of GAI in dual-language classrooms is likewise consistent with the findings of Joo (2024) and Yan (2023), who emphasised its ability to enhance collaboration, promote learner engagement, and strengthen writing fluency. The evidence presented here also confirms that AI-based writing partners and chatbots can provide immediate feedback, thereby improving productivity in bilingual learning contexts. Nonetheless, this investigation stresses the need for measured integration, as overuse risks diminishing critical thinking and reducing learner agency, a position also articulated by Lee-Price (2024). This research also affirms

the opportunities and risks identified in prior literature. Ethical challenges related to bias, privacy, and governance, as highlighted by [Taeihagh \(2025\)](#), remain central to the adoption of GAI. At the same time, the capacity of AI to facilitate feedback and self-regulated learning echoes the conclusions of [Sylvia IV and Reeves \(2024\)](#). The present study, however, contextualises these debates within bilingual frameworks, drawing attention to structural inequities in access and the governance concerns raised by [Spector-Bagdady \(2023\)](#). The findings therefore highlight the need for institutional policies that safeguard fairness, prevent academic misconduct, and ensure equitable access to AI resources, particularly in multilingual settings.

On ethical and equity issues, this research parallels the arguments of [Ajiye and Omokhabi \(2025\)](#) and [Donnell et al. \(2024\)](#), who raised concerns about plagiarism, intellectual property, and the decline in student engagement resulting from over-reliance on AI. The present study supports these conclusions but further situates them within bilingual contexts, noting that disparities in access across linguistic groups can exacerbate inequalities. It suggests that both students and teachers should be equipped with AI literacy and ethical training, reinforcing the perspective of [Moy and Feldstein \(2024\)](#). Finally, the role of educators in moderating AI use is reaffirmed, consistent with the observations of [Yao et al. \(2025\)](#) and [Aladini et al. \(2025\)](#). While their work highlights the capacity of AI to promote writing proficiency and self-regulation, the present study stresses that teachers remain indispensable in ensuring that AI complements rather than supplants pedagogical practice. Educators must guide learners towards meaningful application of AI, fostering creativity and independence while mitigating risks of overdependence.

Theoretical Implications

This study advances the theoretical discourse on the role of GAI in strengthening L2 writing literacy within bilingual education. The findings demonstrate that GAI applications, such as ChatGPT, foster personalised and adaptive writing environments. This is consistent with [Lu and Ba \(2025\)](#), who observed that AI-driven feedback enhances both learner engagement and writing proficiency. The results also align with [Kalantzis and Cope \(2025\)](#), who stressed the significance of multimodal literacy, highlighting that GAI not only supports grammatical accuracy but also cultivates creativity and critical thought through the integration of textual and visual communication modes. The outcomes further substantiate the arguments of [Lin et al. \(2025\)](#), who emphasised the role of AI in facilitating cross-linguistic transfer within multicultural classrooms, thereby reinforcing the pedagogical benefits of multilingual assistance. Additionally, the study extends the framework proposed by [Lee and Cho \(2025\)](#), advocating for a hybrid model that combines conventional methods with digital innovations to prevent undue reliance on automated systems. Collectively, these insights enrich the theoretical understanding of how GAI can be systematically embedded in bilingual contexts, offering educators practical guidance on pedagogical strategies while also underscoring the ethical dimensions of AI-mediated learning.

Conclusion

This study demonstrates the considerable promise of GAI in advancing L2 writing literacy within bilingual education, offering valuable support for both learners and instructors. Tools such as ChatGPT provide tailored feedback, strengthen writing performance, and foster greater learner engagement. However, concerns remain regarding academic integrity, overdependence on automated systems, and the essential role of teacher guidance. These factors necessitate a cautious approach to integration, ensuring that GAI serves as a complementary aid to conventional writing pedagogy rather than a substitute.

Limitations of the Study

The limitations of this study stem primarily from its dependence on secondary data derived from the systematic literature review and the restricted range of databases employed. As the analysis relied exclusively on existing scholarly publications, it does not incorporate first-hand evidence from L2 learners or language educators within bilingual settings. The absence of such empirical insights reduces the contextual depth of the findings and limits the ability to capture lived experiences that could have strengthened the study's applicability.

Future Work

Future research should prioritise empirical studies that directly measure the impact of GAI tools within bilingual classrooms, particularly focusing on learners' progress in writing proficiency. Longitudinal investigations would also be valuable for assessing the sustained effectiveness of AI-generated feedback over time. Furthermore, such studies could offer deeper insights into the ethical challenges linked to AI integration, including issues of academic integrity and the practical complexities of embedding AI across diverse educational contexts.

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