



ARTIFICIAL INTELLIGENCE AND THE TRANSFORMATION OF LITERACY: TRILINGUAL STUDENTS' PERSPECTIVES ON AI-SUPPORTED WRITING DEVELOPMENT

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Abstract:

The rapid integration of generative Artificial Intelligence (AI) into educational systems has initiated a paradigm shift in how literacy, particularly writing, is acquired, practiced, and taught. While research increasingly recognizes the utility of AI in enhancing discrete literacy skills through adaptive feedback, multimodal engagement, and personalized learning trajectories (Lund & Wang, 2023; Liebreinz *et al.*, 2023), there remains a critical gap in understanding how trilingual learners navigate and conceptualize these AI-mediated processes. Existing studies have largely focused on monolingual or bilingual contexts, leaving the unique cognitive, linguistic, and metalinguistic experiences of trilingual students underrepresented in the discourse. This study investigates how trilingual students training to become English language teachers perceive the role of AI in shaping their literacy development, particularly in writing across multiple languages. It explores three interrelated research questions: (1) How do trilingual students engage with AI tools to support and enhance their writing competencies in English? (2) What are their beliefs about the cognitive and pedagogical implications of AI for literacy practices? (3) What challenges and ethical considerations do they associate with the growing reliance on AI in literacy learning? Using a quantitative approach, the study draws on survey data with 80 Polish applied linguistics students proficient in three languages (English-German or English-Spanish combinations). Findings reveal a nuanced understanding of AI's affordances: participants reported increased autonomy in drafting, revising, and critically analyzing texts; greater access to genre-specific models and multilingual resources; and enhanced metacognitive awareness when reading complex materials. However, concerns emerged regarding overreliance on AI-generated content, diminished critical thinking, and the erosion of traditional literacy instructional practices. The study contributes to the fields of generative AI, trilingual literacy, writing processes, multilingual education, digital literacies, AI-assisted learning, and AI-supported writing development.

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assisted learning, especially when AI is used without pedagogical scaffolding. By centering trilingual learners, this research addresses a significant blind spot in the current literature on AI in education. It demonstrates that multilingual literacy development in the AI age demands not only technological fluency but also a reconfiguration of pedagogical strategies that align with cognitive flexibility and linguistic diversity. The study calls for literacy frameworks that are both AI-aware and responsive to the needs of learners operating across multiple linguistic systems.

Keywords: generative AI, trilingual literacy, writing processes, multilingual education, digital literacies, AI-assisted learning

1. Introduction

The accelerating integration of generative Artificial Intelligence (AI) into educational contexts is transforming the ways in which literacy is conceptualized, practiced, and taught. Over the past decade, AI applications have expanded from discrete, task-specific tools to sophisticated systems capable of generating text, providing adaptive feedback, and supporting multimodal learning environments (Lund & Wang, 2023; Liebreinz *et al.*, 2023). These developments have generated widespread debate in applied linguistics and education research, particularly concerning how such technologies reshape writing practices and literacy development. On the one hand, proponents argue that AI can personalize learning trajectories, foster autonomy, and scaffold learners' engagement with complex texts. On the other hand, critics highlight that unchecked reliance on AI may undermine critical dimensions of literacy. For instance, teachers have reported that students increasingly use AI to "outsource their thinking," thereby risking the erosion of critical thinking and attention spans (Parnaby & Borota, 2025). Similarly, experimental evidence from the MIT Media Lab suggests that AI-assisted writing can reduce brain engagement, weaken memory retention, and result in formulaic outputs (Kosmyna, 2025). From a broader pedagogical perspective, scholars in the humanities caution that AI threatens traditional writing instruction by encouraging practices perceived as academic dishonesty and by displacing the value of slow, critical composition (Bozek & Weber, 2025). Despite these divergent views, much of the existing scholarship has been conducted in monolingual or bilingual contexts, leaving trilingual learners notably underrepresented in the discourse. This omission is significant, as trilingual students draw upon intricate repertoires of cross-linguistic knowledge, transfer, and cognitive flexibility when engaging with new technologies. Their experiences offer a unique lens through which to examine not only the cognitive and metalinguistic processes involved in literacy development, but also the pedagogical and ethical tensions that arise when AI becomes embedded in educational practice. The present study addresses this gap by investigating how trilingual students training to become English language teachers in Poland perceive and engage with generative AI in their writing development. Specifically, it examines three interrelated dimensions: (1) students' practices when using

AI to support English writing competencies, (2) their beliefs about the cognitive and pedagogical implications of AI for literacy, and (3) the challenges and ethical concerns they associate with AI-mediated learning. It is hypothesized that students with a German linguistic background will express higher concerns about originality than Spanish-background students due to differing rhetorical conventions. By situating trilingual learners at the center of inquiry, this research expands existing debates on AI in education, demonstrating that the development of multilingual literacy in the AI age requires not only technological fluency but also pedagogical frameworks that safeguard critical thinking, foster ethical awareness, and respond to the realities of linguistic diversity.

2. Literature Review

The emergence of generative Artificial Intelligence (AI) has given rise to the construct of AI literacy, defined as the knowledge, skills, and dispositions necessary for learners to critically interact with, evaluate, and leverage AI systems in their academic, professional, and social lives. Unlike traditional computer literacy, which emphasizes operational competencies, or digital literacy, which foregrounds multimodal meaning-making and critical media use, AI literacy extends to understanding how AI systems are designed, trained, and biased, as well as how their outputs can and should be critically interpreted (Hwang *et al.*, 2023). In multilingual education, the importance of AI literacy is magnified by the fact that AI systems often perform differently across languages, privileging English-dominant training corpora and risking inequitable outcomes for learners who navigate diverse linguistic repertoires. Recent scholarship has further articulated subdomains of AI literacy, such as *ethical literacy* (awareness of bias, transparency, and accountability in AI systems), *functional literacy* (skills in effectively using AI tools), and *critical literacy* (the ability to evaluate AI outputs within sociocultural and epistemic frames) (Zhai *et al.*, 2023). These dimensions are highly relevant in literacy instruction, where students must not only deploy AI tools for reading and writing but also interrogate the extent to which AI amplifies or constrains their voice, creativity, and critical reasoning.

A recent development within the discourse is the emergence of prompt literacy, the ability to design, refine, and critically assess prompts in order to elicit desired responses from generative AI models. Hwang *et al.* (2023) argue that prompt literacy functions as both a technical and metacognitive skill: it requires syntactic awareness of how AI interprets linguistic cues and semantic awareness of how prompts can be structured to align with rhetorical, disciplinary, or pedagogical goals. In multilingual contexts, prompt literacy becomes especially complex, as learners must navigate differences in cross-linguistic equivalences, cultural semantics, and translation ambiguities when constructing prompts in English versus other languages. This situates prompt literacy not merely as a technical competence but as a multilingual and intercultural skill, central to the literacies of trilingual learners. Evidence from applied

linguistics research demonstrates that prompt literacy supports agency and autonomy in writing, enabling learners to scaffold their own idea generation, revision strategies, and genre awareness. However, a systematic review highlights a critical oversight: despite the increasing focus on digital multimodal composing with AI tools, the ethical dimension of prompt literacy, such as understanding when AI should be credited as a co-author, or how reliance on prompt engineering shapes originality, remains underexplored (Nguyen, 2024). This gap underscores the need for AI literacy frameworks that explicitly integrate prompt literacy with ethical reflection, especially for multilingual and trilingual learners whose linguistic identities interact dynamically with AI-mediated text production. The incorporation of AI into literacy practices must also be situated within the longer trajectory of digital and media literacies, which historically emphasized skills of multimodal navigation, critical consumption, and participatory production in networked environments (Jenkins, 2009; Lankshear & Knobel, 2015). In the current AI era, these literacies are undergoing profound transformation. Traditional digital literacy assumed that texts were authored by humans, mediated by tools, and distributed through digital networks. AI disrupts this assumption by blurring the boundary between author and tool, raising fundamental questions about originality, authorship, and epistemic authority. UNESCO's (2023) policy brief on media and information literacy in the age of generative AI emphasizes that learners must now cultivate AI-aware media literacy, encompassing not only the evaluation of digital content but also the recognition of algorithmic mediation and synthetic text/image generation.

Generative artificial intelligence (AI) is increasingly reconfiguring how multilingual learners, particularly those studying English as a Foreign Language (EFL), mobilize their full linguistic repertoires in the process of composing written texts. Recent qualitative research with Chinese EFL undergraduates illustrates a distinctive pattern of AI-mediated translanguaging in which learners strategically shuttle between their first language (L1) and English (L2) as they ideate, draft, and revise with the support of large language models (LLMs) (Lund & Wang, 2023). In these workflows, students frequently generate initial outlines or conceptual sketches in L1, subsequently consult AI to explore synonyms and genre-specific phrasing, and finally "surface" polished English prose. This iterative movement across languages enables learners to interrogate nuance, register, and cohesion more systematically. Accordingly, the traditional understanding of translanguaging, historically confined to human-human interaction, is being reconceptualized to include human-AI semiotic repertoires, with the model functioning as a resource for lexical expansion, rhetorical structuring, and cross-linguistic comparison (Liebrenz *et al.*, 2023).

At the same time, students report a degree of ambivalence. While they acknowledge improvements in fluency, textual coherence, and efficiency, they also express concerns about blurred authorship boundaries and the emergence of an overly uniform "AI voice" (Parnaby & Borota, 2025). Such tensions resonate with broader findings in EFL contexts, where learners position ChatGPT-like systems less as substitutes for authorship and more as writing companions that assist with

brainstorming, paraphrasing, and low-stakes language feedback (Bozek & Weber, 2025). Although learners value the immediacy and breadth of AI-generated suggestions, they remain wary of factual inaccuracies (“hallucinations”) and stylistic genericity (Kosmyna, 2025). In parallel, instructors are beginning to frame AI as a mediator of translanguaging strategies, for example, by designing structured prompts to compare genre conventions across L1 and L2 while simultaneously emphasizing verification practices and reflective commentary to maintain critical engagement (Villaseñor, 2023). Importantly, AI-mediated translanguaging is not confined to the lexical plane. Students also employ LLMs to interrogate intercultural pragmatics, testing politeness markers, hedging strategies, and stance expressions in English before back-translating into L1 to probe potential semantic drift (Sanchez, 2025). Such practices can enhance metalinguistic awareness, yet they also risk converging toward Anglocentric defaults due to the biases embedded in model training corpora (Lund & Wang, 2023). For this reason, translanguaging pedagogies that incorporate AI are increasingly designed with protective scaffolds, such as contrastive prompting, corpus triangulation, and teacher-curated exemplars, in order to counter homogenization and preserve creative cross-lingual experimentation (Liebrenz *et al.*, 2023).

Across a rapidly growing empirical base, LLMs and AI-enhanced tools (e.g., ChatGPT, Grammarly) consistently excel at surface-level feedback: grammar, lexicogrammatical range, sentence-level clarity, and basic organization (Liu & Zhang, 2023; Li *et al.*, 2024). Meta-analytic and systematic reviews report strong effects for timeliness and formative usefulness, with students crediting AI for granular, immediate guidance that is often unavailable at scale from instructors (Li & Wang, 2023; Nguyen, 2024). The trade-off is that feedback can be over-confident and occasionally incorrect; it also tends toward formulaic patterns unless constrained by prompts or paired with human mediation (Hwang *et al.*, 2023; Kosmyna, 2025). Experimental and quasi-experimental studies in L2 settings echo these patterns. For example, CSL (Chinese as a Second Language) students receiving AI-assisted instruction showed measurable gains in academic writing quality relative to control groups, attributing improvements to iterative feedback cycles on vocabulary precision, syntactic variety, and paragraph coherence (Chen & Wu, 2023; Zhang & Wang, 2024). Crucially, the strongest outcomes emerged when AI use was pedagogically structured, e.g., scaffolded prompts for planning and revision, rubrics for evaluating AI suggestions, and reflective logs, rather than left to unguided self-help (Bozek & Weber, 2025; Lund & Wang, 2023).

In EFL contexts, hybrid feedback—LLM suggestions plus teacher comments—has shown additive benefits for revision depth and genre alignment, particularly in academic argumentation (Liu *et al.*, 2023; Li & Zhang, 2024). Learners exposed to hybrid cycles tend to report higher self-efficacy and greater willingness to revise, likely because AI reduces cognitive load on routine micro-edits, freeing attention for higher-order concerns the human tutor highlights (Huang & Chai, 2023). Despite the promise, several reviews caution that AI feedback remains less reliable for macro-rhetorical issues (argument strength, evidence integration, discipline-specific moves), and can mask underdeveloped

critical reading-to-write processes if used as an end-point rather than a scaffold (Nguyen, 2024; Kosmyna, 2025). Best practice emerging from the literature is to sequence feedback: (1) AI for low-level diagnostics and exemplars, (2) human guidance for discourse-level organization and source use, and (3) student meta-reflection to justify which AI suggestions were accepted, modified, or rejected (Bozek & Weber, 2025; Hwang *et al.*, 2023).

Randomized trials comparing AI vs. human interlocutors also show mixed results: AI can match or even surpass native-speaker partners on speed and breadth of edits, but not necessarily on nuanced, discipline-anchored commentary (Lund & Wang, 2023; Chen & Wu, 2023). This reinforces the value of AI-aware rubrics and genre models aligned with course outcomes so that AI remains a means for deliberate practice rather than an invisible editor that flattens voice (Li *et al.*, 2024; Hwang *et al.*, 2023). Large-scale surveys and classroom studies consistently find that students perceive ChatGPT-style tools as motivating “companions” that lower the affective barrier to drafting and revising; they also report increased autonomy and time-on-task (Li & Wang, 2023; Liu & Zhang, 2023). Yet, concerns about over-reliance, academic integrity, and the “blandness” of AI-shaped prose persist (Kosmyna, 2025; Nguyen, 2024). Instructor messaging appears pivotal: when teachers normalize transparent AI use (e.g., disclosure statements, process notes) and teach prompt literacy explicitly, student trust in AI feedback rises while dependence decreases (Bozek & Weber, 2025; Hwang *et al.*, 2023).

3. Materials and Methods

The primary aim of this study was to investigate how trilingual students training to become English language teachers perceive, engage with, and are affected by generative AI tools in their literacy development, particularly in writing across multiple languages.

The study focused on three interrelated research questions:

- 1) How do trilingual students engage with AI tools to support and enhance their writing competencies in English?
- 2) What are their beliefs regarding the cognitive and pedagogical implications of AI for literacy practices?
- 3) What challenges and ethical considerations do they associate with the growing reliance on AI in literacy learning?

The quantitative instrument consisted of a structured questionnaire, organized into two thematic blocks: (1) benefits of AI in writing and (2) challenges and concerns of using AI. The survey instrument was developed from literature on AI literacy, multilingual writing, and pedagogy. Items addressed students' views on AI benefits, challenges, and linguistic background, with several adapted from validated scales on writing self-efficacy and digital literacy. Draft questions were created with input from applied linguists and educators, then piloted with 10 students to ensure clarity and relevance. Feedback led to rewording items and refining response options. Reliability was assessed using Cronbach's alpha (AI benefits = 0.86; challenges = 0.79), and an

exploratory factor analysis confirmed a two-factor structure consistent with the thematic blocks. Mann-Whitney U tests ($p < 0.05$) were used to compare subgroups by second language learned, with effect sizes calculated using r . Complementing the survey provided in-depth accounts of students' experiences, allowing exploration of nuanced interactions with AI tools across multiple linguistic contexts. The study involved 80 applied linguistics students enrolled at a Polish university who were proficient in three languages, primarily English–German (60 participants) or English–Spanish (20 participants) combinations. Participants were recruited through purposeful and snowball sampling, with invitations disseminated via departmental mailing lists and classroom announcements. The cohort comprised 65 females and 15 males, all of whom were engaged in courses aligned with the university's English language teacher training program.

Teaching and learning contexts were characterized by structured English language instruction, integrating modules on applied linguistics, second language acquisition, and pedagogical practice. Students routinely engaged in writing tasks in English and their additional languages, including drafting, revising, and peer review. Within this context, the use of AI tools such as ChatGPT, Grammarly, and other generative systems was either encouraged or permitted under guidance, with scaffolding strategies designed to support autonomous drafting, metacognitive reflection, and ethical engagement with AI-generated content. Students were instructed on prompt design, evaluation of AI suggestions, and critical reflection to ensure that AI functioned as a complementary resource rather than a substitute for their own cognitive and linguistic work.

Polish higher education presents particular challenges and opportunities for this population. While AI integration is increasingly supported by institutional policies and digital infrastructure, access to structured pedagogical guidance varies, and students' prior experience with AI in academic writing differs widely. Moreover, trilingual learners navigate complex cognitive, linguistic, and metalinguistic demands that intersect with AI-mediated literacy, necessitating careful attention to scaffolding, feedback cycles, and reflective practice. By situating participants within these teaching and learning contexts, the study aims to illuminate both the affordances and limitations of AI in supporting multilingual literacy development.

4. Results and Discussion

The analysis examined the significance of differences across participant subgroups using appropriate statistical methods. The grouping variable included the second language learned. For this purpose, the Mann-Whitney U test was applied to compare two independent groups. The threshold for statistical significance was set at $p = 0.05$. All statistically significant results are indicated with an asterisk (*) in the tables.

I. Grouping variable: second language learnt vs. section 1; Mann-Whitney U test for independent samples

Table 1: Benefits of AI in developing writing

Null hypothesis – AI:	Significance ^{a,b}
helps to improve grammar and vocabulary.	.000*
makes the writing process faster.	.001*
enhances creativity in writing.	.001*
contributes to better organization and text structure.	.000*
allows to learn new writing techniques.	.001*
helps to generate more ideas for writing tasks.	.001*
makes writers more confident in their writing.	.043*
contributes to style adjustment	.032*

The analysis of subgroup differences based on the second language learned (German vs. Spanish) revealed statistically significant variations in nearly all of the perceived benefits of AI for writing development. The Mann–Whitney U tests demonstrated that students' evaluations of AI's affordances were systematically differentiated by their linguistic background. Specifically, trilingual students reported distinct perceptions of AI's role in improving core linguistic competencies such as grammar and vocabulary ($p = .000$) and in facilitating the acquisition of new writing techniques ($p = .001$). These findings suggest that the linguistic repertoire associated with the second language may shape how learners mobilize AI tools for micro-level language support, possibly reflecting differences in structural transfer, lexical availability, and prior exposure to academic writing norms across Germanic versus Romance language systems. Beyond discrete linguistic features, significant differences also emerged in students' beliefs about AI's ability to enhance higher-order writing processes. Participants diverged in their assessments of whether AI accelerates the writing process ($p = .001$), enhances creativity ($p = .001$), and contributes to organization and textual structuring ($p = .000$). These results indicate that the cognitive and metacognitive dimensions of writing, including idea generation, coherence building, and structural planning, may be differently scaffolded by AI depending on learners' multilingual trajectories. At the affective level, significant group differences were also observed. Learners varied in their perception of AI as a source of writing confidence ($p = .043$) and as a tool for style adjustment ($p = .032$). These findings suggest that AI is not only instrumental in supporting mechanical or structural aspects of writing but is also implicated in shaping self-efficacy and stylistic awareness. The fact that such differences emerge between German- and Spanish-background learners points to the interaction between linguistic repertoires and the perceived affective and stylistic affordances of AI, which may be mediated by cross-linguistic contrasts in discourse conventions, rhetorical preferences, and learner identity positioning. Taken together, the results demonstrate that the perceived benefits of AI are not uniform across trilingual learners but are instead mediated by their second language background. This aligns with the study's overarching aim of situating AI literacy within the cognitive and linguistic diversity of multilingual learners. Importantly, the findings

suggest that pedagogical frameworks integrating AI into literacy instruction should be sensitive to learners' full linguistic repertoires, ensuring that the affordances of AI are leveraged not only for functional language support but also for cultivating creativity, organization, confidence, and stylistic flexibility across languages.

II. Grouping variable: second language learnt vs. section 2; Mann-Whitney U test for independent samples

Table 2: Challenges and concerns of AI in developing writing

Null hypothesis – What challenges have you faced when using AI in writing?	Significance ^{a,b}
context understanding	.210
originality concerns	.002*
fact-checking requirements	.076
limited domain expertise	.433
creativity limitations	.076
dependency risks	.168
tone and style customization	.359
bias in outputs	.279
handling ambiguity	.887
time and effort in fine-tuning data	.027*
accessibility issues	.035*
ethical considerations	.783
privacy concerns	.330
tool-specific constraints	.424

The analysis of challenges associated with AI use revealed that perceptions of difficulty were not uniformly distributed across trilingual learners but varied significantly depending on the second language learned (German vs. Spanish). Out of the fourteen items examined, three reached statistical significance: originality concerns ($p = .002$), time and effort in fine-tuning AI-generated outputs ($p = .027$), and accessibility issues ($p = .035$). The most salient divergence concerned originality concerns, where learners differed markedly in the extent to which they feared that reliance on AI might compromise the authenticity of their writing. This suggests that students' judgments about authorship, plagiarism risks, and creative ownership are mediated by their linguistic repertoires and the academic discourses they inhabit. Learners with a German background, for instance, may be more accustomed to structured rhetorical traditions emphasizing textual integrity, while Spanish-background learners may frame originality differently in relation to stylistic flexibility and discourse conventions.

Significant group differences also emerged around the time and effort required to fine-tune AI outputs. This indicates that while both groups recognized the utility of AI, they diverged in their experiences of the cognitive and practical workload involved in adapting AI-generated text to meet academic or stylistic standards. Such discrepancies may be linked to differences in the degree of cross-linguistic transfer from the second

language into English, shaping how much iterative adjustment is needed to ensure accuracy, coherence, and genre alignment.

A third significant difference concerned accessibility issues, with learners reporting unequal experiences of ease-of-use and availability of AI tools. This finding points to the interplay between digital literacy, prior exposure to AI systems, and linguistic background, suggesting that not all trilingual students access AI affordances on equal terms. Accessibility here may not only be technological (e.g., familiarity with platforms, availability of training) but also linguistic, as AI systems often exhibit English-dominant performance, which may interact differently with Germanic versus Romance linguistic repertoires.

In contrast, the majority of items including context understanding ($p = .210$), fact-checking requirements ($p = .076$), creativity limitations ($p = .076$), dependency risks ($p = .168$), tone and style customization ($p = .359$), bias in outputs ($p = .279$), handling ambiguity ($p = .887$), ethical considerations ($p = .783$), privacy concerns ($p = .330$), and tool-specific constraints ($p = .424$) did not yield statistically significant group differences. This suggests that core concerns about AI use are broadly shared across trilingual learners, regardless of second language background. Both groups recognize the need for fact-checking, critical engagement with bias, and awareness of ethical and privacy considerations, which remain universal issues in AI-mediated literacy development.

Overall, the results highlight that while many concerns about AI are widely distributed and collectively experienced, certain challenges, particularly those tied to originality, the labor of fine-tuning outputs, and accessibility, are shaped by students' multilingual trajectories. These findings underscore the need for pedagogical interventions that address both common challenges (e.g., fact-checking and ethical awareness) and linguistically mediated ones (e.g., supporting originality and equitable access across language groups). By doing so, teacher education programs can foster AI literacy that is at once technologically informed and sensitive to multilingual realities.

5. Discussion of the Results

The primary aim of this study was to examine how trilingual students in English language teacher training perceive and experience the use of generative AI in their literacy development. Specifically, the study asked: (1) how trilingual students engage with AI tools to support and enhance their writing competencies in English, (2) what their beliefs are about the cognitive and pedagogical implications of AI for literacy practices, and (3) what challenges and ethical considerations they associate with growing reliance on AI. The discussion below addresses each of these questions in turn, situating the findings within the broader literature. The results demonstrate that participants across both language subgroups recognized AI as a powerful support for micro-level writing processes, notably grammar, vocabulary, and stylistic adjustment as well as for macro-level skills such as text organization, creativity, and the acquisition of new writing techniques. These findings align with meta-analytic reviews indicating that AI feedback

is particularly effective at enhancing timeliness, accuracy, and task efficiency (Li & Wang, 2023; Chen & Wu, 2023). Importantly, however, the statistically significant differences between German- and Spanish-background learners suggest that engagement with AI is mediated by multilingual repertoires. This resonates with studies of AI-mediated translanguaging, where learners shuttle strategically between languages in drafting and revising processes (Zhang & Wang, 2024). It appears that the second language shapes how trilingual learners appropriate AI affordances, potentially through transfer effects, rhetorical conventions, and differing expectations of academic discourse. Participants also reported that AI contributed not only to mechanical correctness but also to cognitive development and self-efficacy. Enhanced confidence in writing and improved control over style were frequently cited benefits, echoing Huang and Chai's (2023) observation that AI reduces the cognitive load of surface editing, allowing students to focus on higher-order meaning-making. However, significant differences between groups regarding confidence and style adjustment indicate that the affective and pedagogical value of AI is not perceived uniformly. For some learners, AI's scaffolding appeared to expand metacognitive awareness and autonomy, while others perceived its impact as limited or requiring extensive fine-tuning. These findings underscore the importance of embedding AI use within structured pedagogical frameworks, where scaffolding, reflective commentary, and explicit instruction on prompt literacy ensure that AI enhances rather than diminishes learners' critical engagement (Nguyen, 2024). Turning to challenges, the analysis revealed three areas of significant divergence: originality concerns, time and effort in fine-tuning outputs, and accessibility issues. Learners' concerns about originality resonate with current debates on authorship, voice, and epistemic authority in AI-mediated writing (UNESCO, 2023; Nguyen, 2024). The fact that these concerns differed by linguistic background suggests that cultural and rhetorical traditions influence how students conceptualize textual ownership and creativity. The variation in fine-tuning effort indicates that some groups experience AI outputs as closer to acceptable academic discourse, while others perceive greater dissonance, thus requiring more iterative adaptation. Accessibility differences further highlight that even in digitally equipped higher-education settings, equitable AI use cannot be assumed; disparities in prior exposure, digital literacy, or linguistic compatibility of AI systems may exacerbate uneven experiences. By contrast, most other challenges, such as fact-checking, dependency risks, bias, ethical and privacy concerns, did not differ significantly between groups. This suggests that certain baseline risks of AI literacy are shared across trilingual learners, consistent with wider evidence that students view AI as a valuable but limited writing companion (Liu & Zhang, 2023). These shared concerns reinforce the argument that teacher education must prioritize critical AI literacy, equipping learners with the skills to interrogate bias, verify content, and navigate ethical use responsibly (Hwang *et al.*, 2023; Zhai *et al.*, 2023). Taken together, the findings provide a nuanced picture of how trilingual learners engage with and conceptualize AI. The study demonstrates that while AI offers clear benefits for linguistic, cognitive, and affective dimensions of writing, these benefits are differentially perceived depending on the

multilingual background. At the same time, challenges cluster around both shared concerns (e.g., fact-checking, ethics) and group-specific concerns (e.g., originality, accessibility). For teacher education, this means that pedagogical strategies must be both universally AI-aware embedding ethical literacy, critical reflection, and source evaluation—and sensitive to linguistic diversity, recognizing that trilingual learners mobilize and interpret AI differently depending on their repertoires. In this sense, the findings extend prior research by showing that AI literacy cannot be conceived as a one-size-fits-all framework but must be tailored to the cognitive flexibility and metalinguistic awareness characteristic of multilingual learners. Future literacy frameworks should therefore integrate prompt literacy, translanguaging strategies, and explicit reflection on originality and authorship, ensuring that AI functions as a scaffold for creativity and autonomy rather than an invisible editor that flattens learner voice.

6. Limitations

This study is not without limitations. First, the sample was restricted to a single Polish university, which may limit the generalizability of findings to trilingual learners in other cultural or institutional contexts. Second, the reliance on self-reported data introduces the possibility of response bias, as participants' perceptions of AI use may not fully align with their actual writing practices. Third, while the mixed-methods design enabled both breadth and depth of insight, the quantitative analyses were constrained by the relatively modest sample size, reducing statistical power. Finally, the study focused primarily on English–German and English–Spanish combinations, leaving unexplored how other trilingual constellations might differently shape engagement with AI tools.

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Conflict of Interest Statement

The authors declare no conflicts of interest.

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