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Padlet-Based Collaborative Writing and Digital Competence in EFL Academic Writing: Evidence from Indonesian Higher Education

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Abstract

This study addresses a limitation in digital collaborative writing research by positioning digital competence as a moderating mechanism shaping students' participation in Padlet-based collaborative academic writing, rather than treating it as a background learner characteristic. Previous studies have mainly examined learning outcomes or engagement when using collaborative platforms, with limited attention to how differences in digital competence influence collaborative interaction processes in technology-mediated writing environments. Using an explanatory sequential mixed-methods design, this study involved 30 undergraduate students in an Academic Writing course at a private Indonesian university. Data were collected through a digital competence questionnaire, pre- and post-writing tests, and semi-structured interviews. The findings show that Padlet supported improvements in idea organization, peer interaction, and higher-order writing performance, while digital competence shaped students' interaction strategies and participation patterns. This study contributes by demonstrating that digital competence is a key mechanism influencing collaborative writing participation in higher education digital learning environments.

A. Introduction

Digital technologies have become an integral part of contemporary higher education, transforming how students learn, communicate, and engage in academic writing. In EFL contexts, the increasing adoption of digital learning environments has expanded opportunities for interaction, collaboration, and skill development, enabling students to co-construct knowledge and receive immediate feedback (Aljuaid, 2024; Hardinansyah & Hamidah, 2024; Prayudi et al., 2021). These developments reflect broader changes in pedagogical practices driven by the integration of information technology into education (Yakubu et al., 2025; Gopalan, 2016; Legi et al., 2023). Nevertheless, the growing availability of digital collaborative platforms does not necessarily guarantee similar learning experiences for all students. Learners frequently operate within the same digital environment yet demonstrate different levels of participation, interaction, and writing development, suggesting that technological access alone may be insufficient to ensure meaningful collaborative learning (Kwiatkowska & Wiśniewska-Nogaj, 2022; Zhao et al., 2021).

Despite these advancements, a critical challenge remains in ensuring that digital tools are used not only to support individual learning but also to sustain meaningful collaborative processes. Previous studies report that digital tools such as web-based platforms (Mutiamiftah et al., 2018; Togatorop, 2015), email-mediated collaboration, and digital storytelling applications (Alsubaie & Madini, 2018; Mabuan, 2018; Mutiamiftah et al., 2018; Nurramdaeni & Suryaman, 2021; Zakaria et al., 2016) can improve writing performance. However, these studies predominantly evaluate individual learning outcomes rather than examining how collaborative interaction unfolds during digital writing activities. Consequently, the processes through which collaboration contributes to academic writing development remain insufficiently understood.

Recent studies have highlighted the potential of Padlet as a platform for fostering collaborative writing environments by enabling peer interaction, feedback exchange, and content co-construction (Ramadhani et al., 2023). Its flexible design supports key elements of collaborative writing, such as discussion and revision, which are essential for academic writing development (H. Soro et al., 2025; Lestari, 2017). Existing research has also demonstrated Padlet's effectiveness in improving writing performance and enhancing student engagement (Brodahl & Hansen, 2014; Hoang & Hoang, 2024; Imam et al., 2024; Mulyadi et al., 2021; Nawawi & Utami, 2024).

Nevertheless, the dominant focus of these studies remains on learning outcomes, technological affordances, or student engagement, providing limited insight into how collaborative interaction develops among learners during digital writing activities.

One important factor that may explain variation in collaborative writing experiences is students' digital competence. Prior studies recognize that digital competence, comprising knowledge, skills, and attitudes toward technology, plays a significant role in shaping learning experiences (Bucur & Popa, 2017; Han et al., 2024; Zhang & Liu, 2025). In EFL contexts, effective digital collaboration requires competencies such as organizing ideas and providing constructive feedback (Abedi & Tabatabaee-Yazdi, 2023; Rashid et al., 2019), which vary among students and influence how well collaborative platforms support writing development (Kwiatkowska & Wiśniewska-Nogaj, 2022; Zhao et al., 2021). Similarly, previous studies on collaborative writing and digital platforms, including Padlet, have demonstrated their potential to support writing development and collaborative learning (Fathi et al., 2021). However, digital competence has largely been treated as a background learner characteristic rather than as a factor that shapes how students participate in collaborative knowledge construction during digital writing activities.

This limitation reveals a critical gap in the current literature. Although the benefits of digital collaborative writing have been widely documented, limited understanding exists regarding how digital competence influences the mechanisms through which collaborative interaction contributes to academic writing development. As a result, it remains unclear whether successful collaborative writing is primarily driven by the technological affordances of digital platforms or by learners' ability to utilize those affordances effectively during interaction. Addressing this unresolved issue is increasingly important as digital collaborative platforms become central to academic writing instruction worldwide.

To address this gap, this study contributes to the literature by explaining how digital competence influences collaborative writing processes rather than merely writing outcomes in Padlet-based learning environments. This contribution provides a more comprehensive understanding of how digital competence shapes collaborative interaction and, in turn, influences academic writing development in digital learning environments. The novelty of this study lies in conceptualizing digital competence not

merely as a background learner characteristic but as a key mechanism that shapes collaborative interaction and knowledge construction in Padlet-based writing activities.

Therefore, this study aims to examine how students' digital competence influences their academic writing development through Padlet-based collaborative learning in an EFL higher education context. Specifically, it investigates the interplay among digital competence, collaborative interaction, and writing outcomes to provide a more comprehensive understanding of the conditions under which digital platforms can effectively support academic writing development.

B. Method

This study employed an explanatory sequential mixed-methods design to examine how students' digital competence influenced their academic writing development in Padlet-mediated collaborative learning. Quantitative data were collected and analyzed first to identify patterns of writing development across competence levels, followed by qualitative data to explain how differences in competence shaped students' participation, idea negotiation, and peer interaction. This design was selected because quantitative findings alone could not fully capture the variations in collaborative interaction processes within technology-supported writing environments.

The study was conducted at a private university in Semarang, Indonesia, involving 30 undergraduate students enrolled in an Academic Writing course using Padlet as a collaborative platform. Participants were selected purposively based on their direct experience with Padlet-mediated collaborative writing tasks, enabling the study to capture authentic interaction patterns.

Digital competence levels were identified using the DigComp 2.2 framework (Vuorikari et al., 2022), which classifies competence into four levels—fundamental, intermediate, advanced, and highly specialized—across five areas: data literacy, communication and collaboration, digital content creation, safety, and problem solving. However, only advanced and highly specialized levels were identified in the dataset. Therefore, the analysis focused on comparing collaborative interaction patterns and writing development outcomes between these two groups, with digital competence functioning as a moderating grouping variable.

Quantitative data were collected through a 42-item questionnaire adapted from DigComp 2.2 (Vuorikari et al., 2022) and academic writing pre- and post-tests. Content

validity was established through expert review by two digital literacy specialists, and the instrument was piloted (n = 10) to ensure clarity and contextual appropriateness. Academic writing performance was assessed using compare–contrast essay tasks evaluated with an analytic rubric adapted from Brown (2004), covering organization, logical development, grammar, mechanics, and style and quality expression. To ensure scoring reliability, two raters independently evaluated the essays and resolved discrepancies through discussion.

Qualitative data were obtained through semi-structured interviews exploring students' experiences with Padlet, collaborative interaction patterns, and the role of digital competence. Interviews were conducted online, audio-recorded with consent, and transcribed for analysis. Quantitative data were analyzed using SPSS 29. Descriptive statistics summarized data characteristics, while paired-sample t-tests examined differences between pre- and post-test scores. A chi-square test was used to examine associations between digital competence levels and categorized writing outcomes. Qualitative data were analyzed using the interactive model of data reduction, data display, and conclusion drawing (Miles et al., 2014). Trustworthiness was strengthened through pattern comparison using NVivo 11 cluster analysis based on Pearson correlation coefficients.

This study adhered to ethical research standards involving human participants. All participants provided informed consent prior to data collection and were assured of confidentiality and anonymity. Participation was voluntary, and participants reserved the right to withdraw at any stage without consequences.

C. Results and Discussion

This section presents the empirical findings of the study based on both quantitative and qualitative data. The results are organized to reflect patterns of students' digital competence, their engagement in Padlet-mediated collaborative writing, and the observed development of academic writing skills. The presentation focuses on reporting the data and identifying key patterns, which are further interpreted in the subsequent discussion.

1. Results

This section presents the findings related to students' levels of digital competence, their engagement in collaborative writing activities using Padlet, and the effects of Padlet

implementation on the development of their academic writing skills. By examining both students' performance and their experiences, this section highlights the role of Padlet as a digital platform that supports collaboration, enhances engagement, and contributes to improvements in academic writing.

a. Students' digital competence levels

Students' digital competence levels were assessed prior to implementing Padlet-based collaborative writing using a questionnaire adapted from the DigComp 2.2 Framework. Based on the assessment results, students were categorized into two competence levels: Advanced and Highly Specialized. Of the 30 participants, 17 students (56.7%) were classified as Advanced, while 13 students (43.3%) were categorized as Highly Specialized.

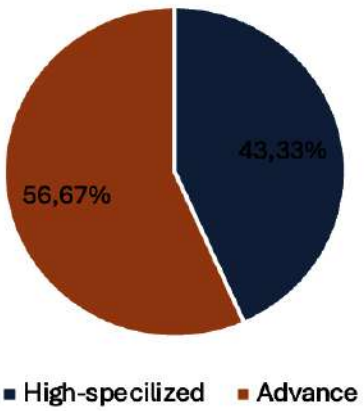

Figure 1. Students' digital competence

A chi-square goodness-of-fit test was conducted to examine whether the distribution of students across the two competence levels differed significantly. The results indicated no statistically significant difference between the observed and expected frequencies, $\chi^2(1) = 0.533$, $p = .465$. These findings indicate that the distribution of students' digital competence levels was statistically balanced between the Advanced and Highly Specialized categories.

b. Writing development in padlet-based collaboration

A paired-samples t-test was conducted to examine differences in pre-test and post-test writing scores among students categorized as Advanced digital competence.

The results showed a statistically significant improvement in writing performance from pre-test (M = 50.82, SD = 8.05) to post-test (M = 81.12, SD = 3.77), t(16) = −17.43, p < .001. The following Figure 2 illustrates improvements across writing components, including organization, logical development of ideas, grammar, punctuation, and mechanics, and style and quality of expression.

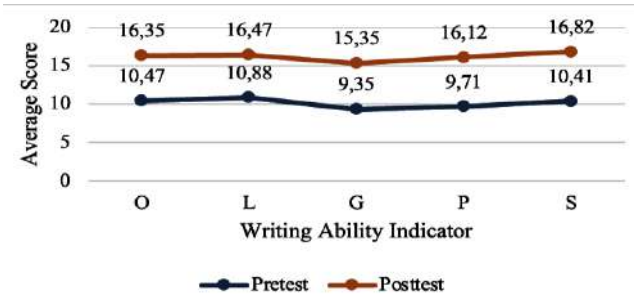

Figure 2. Writing ability of advance students on compare-contrast essay material

Note: O = Organization; L = Logical development of ideas: Content; G = Grammar; P = Punctuation, spelling, and mechanics; S = Style and quality of expression.

Moreover, a paired-samples t-test was also conducted for students categorized with Highly Specialized competence. The analysis revealed a significant improvement in writing scores from pre-test (M = 51.15, SD = 10.07) to post-test (M = 80.77, SD = 4.64), t(12) = −11.25, p < .001. The findings show a statistically significant increase in writing performance across all aspects of writing after the implementation of Padlet-based collaborative writing. Figure 3 presents these improvements across writing components among students in the Highly Specialized competence group.

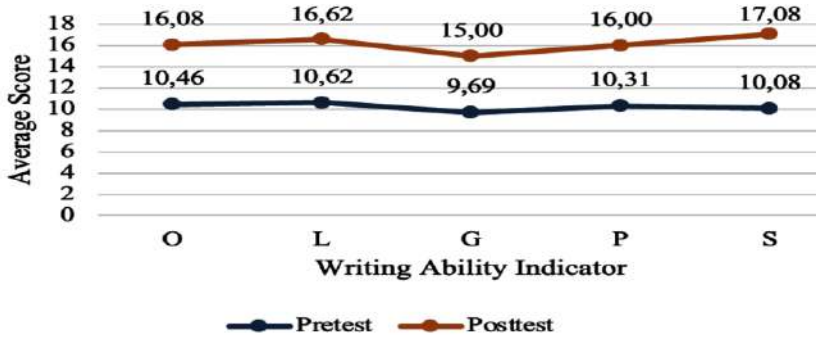

Figure 3. Writing ability of high-specialized students on compare-contrast essay material

Note: O = Organization; L = Logical development of ideas: Content; G = Grammar; P = Punctuation, spelling, and mechanics; S = Style and quality of expression.

c. Effectiveness of padlet-based collaborative writing across competence levels

Descriptive statistics were calculated to compare post-test writing performance between students categorized as Advanced and Highly Specialized.

Table 3. Descriptive statistics (dependent variable: student writing skills)

Students' Digital Competence	Mean	Std. Deviation	N
High-specialized	82.62	7.054	13
Advanced	77.47	9.111	17
Total	79.70	8.551	30

The descriptive statistics for students using Padlet indicate that Highly Specialized students achieved a mean writing score of 82.62 with a standard deviation of 7.054 (n = 13). In contrast, Advanced students had a mean score of 77.47 with a standard deviation of 9.111 (n = 17). The overall mean score for all participants was 79.70 (SD = 8.551, n = 30).

The analysis revealed that the differences in students' writing skills across digital competence levels were not statistically significant. This was shown by the chi-square test, with $\chi 2 = 0.533$ and $p = 0.465 > \alpha = 0.05$, so H0 was accepted.

d. Interview Result

To support the quantitative findings, semi-structured interviews were conducted with 12 participants. The interview data were analyzed using NVivo 11, yielding six major themes related to students' experiences during Padlet-based collaborative writing activities. Figure 4 presents the clustering of interview nodes based on word similarity analysis.

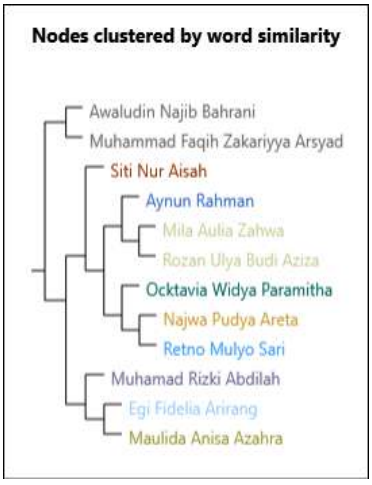

Figure 4. Nodes clustered by word similarity

The first theme concerned patterns of Padlet usage during collaborative writing activities. Students reported using Padlet both during and outside of classroom sessions to draft and revise their assignments. One participant stated, *"I used Padlet in class and also outside class when editing assignments."* (Interview with Participant 7, July 2025). Although initially unfamiliar with the platform, students adapted through repeated use and peer discussion, as noted by another participant:

> *"At first I was confused because it was new, but after discussing with friends, it became easy."* (Interview with Participant 3, July 2025).

This shows that Padlet was actively used as a writing tool, but its design influenced how students experienced the writing process. Padlet served as a continuous writing space, yet its technical constraints shaped how students interacted with and managed their writing tasks.

The second theme relates to the perceived development of academic writing ability. Several participants reported improvements in organizing ideas and structuring essays. As one participant explained, *"My writing became more organized."* (Interview with Participant 2, July 2025). However, some participants perceived grammar improvement as less noticeable compared to other writing components: *"Vocabulary increased, but grammar did not improve much."* (Interview with Participant 5, July 2025).

Thus, Padlet supported macro-level writing development, especially organization and coherence. Padlet's primary contribution was not linguistic accuracy, but rather the enhancement of students' structural awareness and guided writing organization through lecturer feedback.

The third theme concerned the development of digital competence through interaction with the platform. Students reported learning new features through independent exploration, noting that challenges were related to devices and technical issues rather than conceptual difficulty: *"It was difficult to edit using a mobile phone."* (Interview with Participant 8, July 2025). *"Signal problems sometimes became an obstacle."* (Interview with Participant 2, July 2025). This indicates experiential digital learning through tool engagement. Students' digital competence grew not through formal instruction, but through direct interaction with the tool and adaptation to its technical environment.

The fourth theme described collaborative learning experiences during Padlet-based writing activities. Participants reported that collaborative writing reduced

workload and enabled access to peers' work. "*The workload felt lighter because we worked together*". (Interview with Participant 7, July 2025). However, some students reported challenges related to group coordination: "*If a member did not attend class, it affected the group work.*" (Interview with Participant 6, July 2025). Padlet functioned as a shared learning space, not merely a submission platform. The collaborative environment created by Padlet fostered mutual learning while simultaneously revealing the social dynamics that influenced group writing processes.

The fifth theme concerned suggestions for tool improvement. Students suggested improvements related to formatting features: "*Padlet should add margins and paragraph indentation.*" (Interview with Participant 12, July 2025). These suggestions directly relate to academic writing needs. Students' feedback indicates that improving Padlet's formatting and editing features would better align the tool with the demands of academic writing tasks.

The sixth theme related to the future utilization of Padlet. Some participants reported intentions to use Padlet in future teaching practice: "*I will use Padlet during my internship or teaching practice.*" (Interview with Participant 7, July 2025). However, several participants indicated a continued preference for familiar writing platforms: "*I still prefer Google Docs because I am used to it.*" (Interview with Participant 9, July 2025). This indicates that technology adoption is influenced by prior habits despite recognizing Padlet's advantages. While students acknowledged Padlet's potential for future teaching practice, their intention to adopt it remained shaped by existing technological habits and preferences.

2. Discussion

This study provides a more comprehensive understanding of Padlet-based collaborative writing in EFL higher education by examining not only improvements in writing performance but also the processes through which these improvements occur. The findings indicate that students across different levels of digital competence demonstrated significant progress in academic writing. However, a closer examination of the qualitative data reveals that the ways in which students engaged in collaborative writing activities differed substantially. These differences suggest that the effectiveness of Padlet-based collaborative writing cannot be fully understood by focusing solely on the technological affordances of the platform; instead, it must also consider how learners interact with and utilize these affordances during collaborative tasks.

Building on this interpretation, the findings highlight the central role of digital competence in shaping collaborative writing processes. While Padlet offers features that support interaction, shared drafting, and peer feedback, these features do not function uniformly across all learners, as their effective implementation often requires specific digital literacy support and scaffolding (Kamalitdinovna, 2026; Pinto, 2023). Students with higher levels of digital competence were more capable of navigating the platform, coordinating group work, and engaging actively in idea development and peer interaction, which effectively enriches the collaborative experience (Pinto, 2023). In contrast, students with relatively lower competence encountered technical constraints and coordination challenges that influenced their participation patterns, sometimes leading to lower motivation or reluctance to engage in the interaction (Erydani et al., 2025). This indicates that the effectiveness of collaborative writing in digital environments is closely linked to learners' ability to engage with technology strategically, rather than to the mere presence of the technology itself (Erydani et al., 2025; Muhria et al., 2025; Han et al., 2024).

These findings align with and extend previous research on digital competence in technology-enhanced learning. Prior studies have emphasized the role of digital competence in supporting learner autonomy, engagement, and strategic learning behavior (Redecker, 2017; Bucur & Popa, 2017; Han et al., 2024). In EFL contexts, digital competence has also been associated with metacognitive awareness and writing development (Teng & Zhang, 2020; Umwari & Zulaiha, 2023; Putra et al., 2026). The present study extends these perspectives by demonstrating that digital competence does not merely support individual learning performance but also shapes the social and cognitive processes through which collaborative writing is accomplished. In this context, digital competence influences how learners negotiate meaning, coordinate participation, and contribute to collaborative knowledge construction. Specifically, it shapes how learners participate in interaction, organize ideas, and contribute to collaborative knowledge construction. This finding is consistent with research suggesting that effective digital collaboration requires not only technical skills but also the ability to engage in meaningful communication and feedback exchange (Abedi & Tabatabaee-Yazdi, 2023; Rashid et al., 2019; Zhao et al., 2021).

A particularly important finding emerging from this study is that improvements in writing performance should not be interpreted as evidence that collaborative technologies function equally for all learners. Although quantitative findings indicate

similar gains across competence levels, qualitative data reveal that these gains were achieved through different interactional processes. Students with higher digital competence demonstrated greater flexibility and independence in managing collaborative tasks, whereas others relied more heavily on peer support and experienced challenges in coordinating their contributions. Similar observations have been reported in studies highlighting the influence of learner engagement and interaction quality in technology-mediated collaborative learning (Storch, 2019; Zhao et al., 2021).

This finding challenges the common assumption that comparable improvements in learning outcomes necessarily reflect comparable learning experiences. Instead, the findings demonstrate that students may achieve similar writing gains through substantially different collaborative pathways shaped by their levels of digital competence. This interpretation is consistent with research emphasizing the role of collaborative regulation and meaningful interaction in digital learning environments (Dooly & Sadler, 2016; Abedi & Tabatabaee-Yazdi, 2023). It also supports emerging evidence suggesting that learner characteristics play a crucial role in determining how digital affordances are transformed into meaningful learning experiences (Kwiatkowska & Wiśniewska-Nogaj, 2022; Han et al., 2024; Zhang & Liu, 2025).

From a theoretical perspective, these findings contribute to the development of socio-cognitive models of collaborative writing. Previous research has emphasized the importance of interaction, shared regulation, and co-construction of meaning (Storch, 2019; Ismail et al., 2025; Erydani et al., 2025), while studies on digital environments suggest that technology can enhance these processes by enabling real-time interaction and sustained engagement (Dooly & Sadler, 2016; Li & Kim, 2016). However, the present study suggests that such processes are not automatically facilitated by digital platforms. Instead, the quality and effectiveness of interaction depend on learners' ability to operate within digital environments. In this sense, digital competence influences not only the occurrence of interaction but also its depth and cognitive value. Research indicates that students with higher digital skill levels demonstrate significantly different experiences in collaborative environments, where they are more capable of moving beyond simple information exchange toward the co-construction of knowledge (Bach & Thiel, 2024; Kwiatkowska & Wiśniewska-Nogaj, 2022). This suggests that digital competence should be considered an integral component of

technology-mediated collaborative writing rather than merely a contextual learner characteristic (Herlina et al., 2025; Chen & Yu, 2019).

These insights lead to a more critical understanding of technology-enhanced collaborative writing. Rather than viewing digital platforms as inherently effective tools for improving writing, the findings indicate that their effectiveness is conditional. In particular, the results suggest that digital competence functions as a moderating mechanism that determines how collaborative interaction unfolds and how such interaction contributes to writing development. This perspective moves beyond the dominant view that treats digital competence as a background characteristic and instead positions it as a central factor shaping learning processes.

In addition to these theoretical contributions, the study also highlights several practical challenges in implementing Padlet-based collaborative writing. Issues related to uneven participation, coordination difficulties, and varying levels of peer accountability were observed during group interaction. These challenges are consistent with previous studies emphasizing the importance of structured interaction management in online collaborative learning environments (Thoyib et al., 2025; Hampel & Stickler, 2015; Togatorop, 2015). The findings suggest that effective implementation of digital collaborative writing requires not only appropriate technological tools but also clear instructional design, defined collaborative roles, and active facilitation to support meaningful participation.

The implications of these findings extend beyond the immediate research context. As higher education institutions worldwide continue to accelerate digital transformation, technological access is often viewed as the primary requirement for successful digital learning (Zhao et al., 2021). However, the present findings suggest that access alone may be insufficient. Even within the same technological environment, differences in digital competence can generate unequal patterns of participation, collaboration, and learning. Consequently, efforts to promote educational digitalization should be accompanied by initiatives that strengthen learners' digital competence to ensure that technological innovation contributes not only to instructional effectiveness but also to educational equity and inclusion. However, the present study indicates that the success of such initiatives cannot be assumed. Differences in digital competence among students may lead to uneven participation and learning outcomes, even when access to technology is available (Thoyib et al., 2025). This highlights the importance of integrating digital competence development into instructional practices as part of a

broader effort to promote digital equity in higher education (Kwiatkowska & Wiśniewska-Nogaj, 2022; Zhao et al., 2021).

Taken together, this study contributes to the literature in several important ways. First, it demonstrates that digital competence plays a critical role in shaping collaborative interaction in digital writing environments. Second, it provides empirical evidence that similar improvements in writing performance may result from different interactional processes, depending on learners' digital competence. Third, it offers a more nuanced understanding of the relationship between technology, learner characteristics, and collaborative learning processes. Methodologically, the use of an explanatory mixed-methods design allows for a more comprehensive analysis by combining statistical findings with learners' experiences (Syarifah et al., 2025; Creswell & Creswell, 2018).

Despite these contributions, several limitations should be acknowledged. First, this study was conducted within a single institutional context, which may limit the transferability of the findings to other educational settings with different student profiles, technological infrastructures, and instructional practices. Second, digital competence was measured primarily through self-reported data, which may not fully reflect students' actual performance when using digital tools during collaborative writing activities. Third, the relatively small sample size limits the extent to which variations across competence levels can be generalized. Although the mixed-methods design enabled an in-depth exploration of learners' experiences and interactional processes, these limitations suggest that the findings should be interpreted with caution when applied to different educational and cultural contexts.

D. Conclusion

This study demonstrates that Padlet-based collaborative writing can support the development of academic writing in EFL higher education; however, its effectiveness is not inherent to the platform itself. Rather, the findings indicate that learning outcomes are shaped by the interaction between instructional design and students' digital competence. While students across competence levels showed improvement in writing performance, the processes through which these improvements occurred varied significantly. Specifically, students' ability to engage in idea development, organize arguments, and participate in peer interaction was influenced by how effectively they navigated and utilized the digital environment.

Building on these findings, this study contributes to literature by positioning digital competence as a moderating factor in technology-mediated collaborative writing. Unlike previous perspectives that treat digital competence as a background learner characteristic, this study demonstrates that it plays an active role in shaping participation patterns, interaction quality, and the overall effectiveness of collaborative learning processes. This provides a more nuanced understanding of how digital tools function in educational settings, emphasizing that technological affordances alone are insufficient without corresponding learner readiness and structured pedagogical support.

These findings also have important implications for the implementation of digital collaborative writing in higher education. The results suggest that integrating platforms such as Padlet into academic writing instruction requires not only access to technology but also deliberate efforts to develop students' digital competence and to design structured collaborative activities. Without such alignment, the use of digital tools may lead to uneven participation and varied learning outcomes, particularly in contexts where students' digital readiness differs significantly.

Future research should build on the limitations identified in this study to further strengthen the understanding of digital collaborative writing by extending the scope of investigation across more diverse educational contexts, thereby enabling a more robust examination of the transferability of these findings. Given that digital competence in this study was measured primarily through self-reported data, subsequent studies would benefit from incorporating performance-based assessments to capture a more accurate representation of students' actual abilities in navigating and utilizing digital environments. In addition, considering the relatively short duration of this research, longitudinal approaches are needed to explore how digital competence evolves over time and how such development influences sustained engagement, interaction quality, and academic writing outcomes within collaborative learning settings.

These findings underscore that the effectiveness of digital collaborative writing is not determined by technology alone, but by the ways in which learners engage with it. Therefore, the key to successful implementation lies not in adopting digital platforms, but in aligning technological tools, pedagogical design, and students' digital competence to support meaningful and equitable learning experiences.

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