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Article

Enhancing Students' Performance on Cause-Effect Essays Through ICT-Supported Collaborative Writing

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Abstract
This study examines the impact of ICT-supported collaborative writing on English-major students' performance in cause–effect essay writing at a public university in Vietnam. Adopting a quasi-experimental design, the research utilized pre- and post-tests, a questionnaire, and semi-structured interviews for data collection. Quantitative data were analyzed using SPSS 22.0, including descriptive statistics, paired-sample and independent t-tests, as well as Cohen's *d* to measure effect size and identify differences in writing performance between the experimental and control groups before and after the intervention. For qualitative data, Creswell's (2013) spiral model was employed, with MAXQDA™ Analytics Pro 2020 supporting data organization and analysis. The findings revealed that the use of ICT tools significantly enhances students' cause–effect essay writing, primarily by promoting effective peer collaboration and enabling immediate feedback. While both groups showed improvement, the experimental group outperformed the control group with a large effect size. Students in the experimental group also reported higher levels of engagement and viewed ICT as a valuable aid in organizing ideas and accessing learning resources. These findings offer important pedagogical implications, suggesting that collectively integrating ICT tools into collaborative writing tasks can effectively support students' academic writing development.

Keywords
Cause-effect essay, collaborative writing, ICT, EFL students

1 Introduction

The expansion and accessibility of Information and Communication Technology (ICT) have shifted the focus of education towards the enhancement of language improvement skills (Bui & Bang, 2024).

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This shift is further supported in the background where Computer-assisted Language Learning (CALL) systems, which have significantly contributed to the advancement of second language acquisition. They have facilitated a more active, efficient, and accessible approach to language teaching and learning (Salaberry, 2001; Stockwell & Hubbard, 2013; Teng, 2021). ICT and CALL frameworks have gained significance in evaluating learners' outcomes in language learning through innovative approaches, which include feedback on the learner's pronunciation and grammatical structures and adaptive tests that adjust according to various learners' characteristics (Bui, 2024; Bui & Bang, 2024). Writing within a foreign language has returned to the forefront of the student's attention in a new scenario, and the techniques that involve students to work in pairs or groups have received the most attention and demonstrated beneficial effects (Elola & Oskoz, 2010; Storch, 2005; Strobl, 2014). Collaborative writing (CW) has emerged as an essential pedagogy for EFL writing instruction (Zhang, 2020). Its significance can be attributed to the socio-constructivists and sociocultural perspective that learning cannot be complete without social interactions (Vygotsky, 1978). It is a process based on social interaction, wherein the learners engage in CW which entails effective interaction for knowledge construction within their ZPD. Thus, student collaborative practice enhances their writing and language skills (Storch, 2005; Yim & Warschauer, 2017).

There is a need to stress the role of ICT in improving the CW process in the present day. ICT provides various tools that ease the process of CW and make it more fruitful and participatory (Valtonen, 2011; Yamashita, 2021). First and foremost, ICT can cater to continuous and non-continuous collaboration whereby students would be able to work together at the same time or at different times (Brodahl et al., 2011; Bui, 2024; Bui & Bang, 2024; Holmes, 2003; Kessler et al., 2012; Teng, 2021; Teng & Huang, 2023). Features such as revision history and monitoring of the changes allow the students and teachers to recognize writing processes and the contributions made by each person involved (Yim & Warschauer, 2017). Nowadays, ICT tools enables the incorporation of multimedia, providing and additional advantage for writing (Jiang, 2018). Additionally, the tools available for online collaboration and cloud storage have been noted to enhance levels of involvement and engagement (Godwin, 2016). The provision of inline comments and annotations has also improved just-in-time feedback, increasing the amount of peer and instructor comments (Maita, 2021). Spelling and grammar checkers can be used while writing (Hsu & Lo, 2018). Therefore, these benefits enable the learners to work in a more active, engaging, and resource-rich, collaborative environment, which can lead to improved writing and language learning outcomes.

Although there is an increasing interest in ICT's role in the ELT field, specific areas still need to be explored, especially in writing pedagogy. Prior research has predominantly focused on general language skills or conversational English while the use of ICT in specific writing tasks, such as cause-effect essays, remains under-explored. Furthermore, there is also a noticeable gap in the literature concerning the actual implementation of CW practices utilizing ICT tools by EFL students. Addressing these gaps would have a significant impact on improving Vietnamese EFL students' writing skills and motivation. Therefore, this study sought to address these gaps and promote the effective integration of ICT in teaching writing. As such, the research aimed to assess the impact of CW supported by ICT tools on students' performance in cause-effect essays. Additionally, it also examines students' perceptions towards the application of ICT in these writing tasks.

1. To what extent does ICT-supported CW impact students' performance in cause-effect-essay writing?
2. What are students' perceptions of using ICT for collaborative essay writing?

2 Literature Review

2.1 Theoretical framework

The present study adopted Vygotsky's sociocultural theory as its theoretical framework. As a central concept of this theory, the Zone of Proximal Development (ZPD) defining the gap between what

learners can do independently and what they can achieve with support from more capable peers, is particularly relevant to CW, where peer interaction and feedback serve as key mechanisms for learning and development (Storch, 2005). The sociocultural approach highlights that higher cognitive functions are initially developed through social interactions before becoming internalized as individual abilities. In the context of CW, this developmental process is manifested in students composing together, negotiating meaning, and offering mutual feedback. As Lantolf and Thorne (2006) pointed out, learning is inherently embedded within social activity, occurring as learners interact with people, objects, and events within their environment. It is this interactive dimension that renders CW an effective pedagogical tool. It allows learners to externalize their thinking, receive immediate feedback, and co-construct knowledge related to writing conventions and language structures. As such, CW exemplifies Vygotsky's learning model, particularly when ICT tools are integrated.

The effectiveness of CW as a peer feedback-based and ICT-supported learning model has been well documented in many studies. Yim and Warschauer (2017) demonstrated how technology-facilitated CW fostered environments where students could support each other through comments, suggestions, and revisions and ICT tools allowed participation and contribution to be visibly tracked, making the process more transparent and conducive to peer learning. CW groups characterized by mutual support produced significantly higher-quality texts, illustrating the benefits of peer scaffolding within the ZPD (Li & Zhu, 2017). Paired writing tasks offered learners opportunities to share linguistic resources and engage in languaging - using language to mediate cognitive activity, and through this process, students recognized knowledge gaps and receive immediate peer support, facilitating growth within their ZPD (Storch, 2013). Technology-mediated CW promoted co-construction of knowledge and language through social interaction as digital platforms enable timely feedback, transparent revision histories, and continuous interaction, all of which strengthen the sociocultural foundations of CW (Elola & Oskoz, 2010; Lee, 2010). Another key element, engagement, is also explained by sociocultural theory. Kessler et al. (2012) reported that students engaged in web-based CW developed a sense of collective ownership and responsibility, encouraging deeper participation. This reflects Vygotsky's view of learning as socially driven. In ICT-supported CW, students are accountable not only to themselves but also to their peers, aligning with Donato's (1994) notion of "collective scaffolding" (p.46) where learning emerges collaboratively despite the absence of a single expert. As such,Top of FormBottom of Form As suchAsAsthe sociocultural theory provides a comprehensive explanation of how CW can be effectively employed in educational contexts, due to the inherently social nature of learning in pairs, peer feedback, and active engagement. The concept of ZPD accounts for why students tend to perform better in writing when in a collaborative settings compared to working individually. ICT tools further support these sociocultural processes by creating new opportunities for interaction, scaffolding, and engagement.

2.2 The process-genre approach to teach EFL writing collaboratively

The genre-based writing instruction integrates the systematic steps of the process approach and the context-based analysis of the genre most effectively. Thus, it can be viewed as a significant strategy for English language teaching (Brooks & Grundy, 1990). This strategy focuses on the cascading of the writing process from brainstorming to drafting, revising, and editing for publication (Tompkins & Goss, 1987) as well as the knowledge of the classification of texts and the recognition of their purposes and audiences (Hyland, 2007; Matsuda, 2003).

For this approach of writing instruction, students become part of the writing process by drafting their concepts through several attempts (Matsuda, 2003). At the same time, students also learn to study and use the conventions of different genres while the teacher supports them (Hyland, 2007). This model promotes a comprehensive understanding of the writing process as well as the rationale behind specific writing decisions, fostering a more learner - centered environment. Badger and White (2000) illustrated the integration of writing tasks into broader socio-cultural contexts through the process-genre approach,

highlighting their situated nature and purpose. This approach includes modeling exemplary papers, classroom discussions, imitation, independent writing, class-wide revisions, re-writing, and publication. Such a framework encourages collaborative efforts and thinking among students, and enables them to become aware of the genre conventions to which they apply language (Gao, 2012).

Combining the reflective and interactive approaches of process writing with the instructional aspects of genre analysis improves students' understanding of writing processes and genres. It aligns writing tasks more closely to real life contexts (Gao, 2012), which is crucial for student motivation and engagement in writing (Yan, 2005). Although some steps in EFL writing classes may still be under-utilized, the process-genre approach appear both appealing and effective in cultivating competent and context-sensitive writers in EFL settings (Badger & White, 2000).

2.3 Integrating ICT in CW to promote writing performance

Today, ICT has significantly transformed how students interact with various learning variables, especially in the realm of language acquisition. Among the numerous ICT tools, the integration of Google Docs, Grammarly, Padlet, and Learning Management Systems (LMS) have a positive impact on students' writing processes and outcomes. First, it is important to note that Google Docs is a word-processing application that allows users to edit simultaneously and share their comments, a feature that is invaluable for teamwork. As Maita (2021) emphasized, Google Docs supports CW since students can edit shared documents, thereby enhancing peer collaboration and writing skills. Nguyen (2019) explained that collaborative websites such as Google Docs and Facebook facilitate the collaborative writing process as they allow students to interact actively with peers and instructors and incorporate feedback to improve their writing. Additionally, Grammarly offers substantial support by providing the user with instant suggestions on grammar, style, and even tone. Research exploring EFL students' responses when using Grammarly's editing lists has also shown that the cognitive effort required varied among the participants, and the students' attitudes towards assistive writing artificial intelligence were nuances and multifaced (Koltovskaia, 2020). Dizon and Gayed (2021) also supported Koltovskaia's (2020) results by demonstrating that Grammarly improved the mobile writing quality of Japanese students. The study found improvements in grammatical accuracy and lexical diversity, highlighting the promising use of real time corrective feedback for improving L2 writing for beginner learners.

Apart from Google Docs and Grammarly, Padlet has also proven to be a valuable tool. The usage of Padlet led students to become more active and motivated in their writing assignments, which is highly advantageous as it fosters creativity and idea-sharing for CW projects (Do et al., 2022). The study highlighted that the combination of Padlet and Google Docs transformed students from passive listeners to active participants in the classroom, enhancing their engagement in learning. Additionally, Olives (2019) applied Padlet to develop the English writing abilities of high school students at different writing stages. This study showed that by leveraging Padlet, the process of personal authorship was enhanced through collaborative contexts. In conclusion, the adoption of ICT tools such as Google Docs, Grammarly, and Padlet in EFL writing instruction has collectively revolutionized the way students approach writing, fostering collaboration and enhancing their confidence and the overall quality of their writing.

While ICT tools such as Google Docs, Padlet, and Grammarly are specialized and focus on specific tasks including editing or creating content collectively, LMS provides a comprehensive framework with an entire range of functionalities that allow effective management of all aspects of learning and encouraging collaborations. As an LMS is more structured in terms of the course design and nurtures self-directedness, it is key in coordinating and supervising students' collaborative writing activities. Febriyanti et al. (2022) confirmed that LMS possesses the learning capabilities and communication tools possessed and exhibit high productive usability value in writing instruction. Their findings

also demonstrated that, despite typical problems, such as under provision of broadband and limited interactions with users, the LMS was effective in aiding student participants with specific CW tasks and in providing materials and reviewing tasks for EFL writing classes.

2.4 Research gaps

Although CW has received significant attention, there is limited focus on researching cause-effect essays. While various studies have examined the use of ICT tools in collaborative writing instruction, there is a noticeable lack of research on the collective adoption of these common tools. In additionally, although CW involving the integration of individual ICT tool such as LMS, Google Docs, Grammarly, or Padlet has been explored, insufficient attention has been given to how these individual tools can be combined and utilized at different stages of writing. For this reason, there is a knowledge and practice gap regarding the impact of ICT integration on the cause-effect essay writing and hence regarding students' perceptions of this approach.

3 Methodology

3.1 Research design

The present study employed a quasi-experimental design, as advocated by Creswell and Gutterman (2019) and Reichardt (2019) to address the challenges of random assignment in educational settings. This method is beneficial when ethical, logistical, and practical barriers render randomized experimental designs unfeasible. Instead of randomizing subjects and potentially disrupting the learning process, the present study first used preexisting intact classroom groups of learners. This design is well-suited for examining complex interventions where CW was used in conjunction with ICT allowing the effects of these interventions to be evaluated in a classroom environment.

3.2 Setting and participants

The research was conducted at a state-run university in Vietnam, which provides both online, offline and blended courses in their university-degree programs. The students are within the Internet range during class time and provided with all relevant learning materials. The participants of the study are 79 English major students enrolled in a series of writing modules, culminating in the *Writing 3* course of their program.

Among the participants, 55 are female (69.6%) and 24 male (30.4%). The majority of the students are between 20 and 22 years old (92.4%). All participants employed a variety of gadgets while learning English, and the most common of which were smartphones (50.6%), laptops (41.8%) and desktops (7.6%).

The detailed demographic information of the participants is presented in Table 1.

By the time this study was conducted, these students had completed *Writing 1* and *Writing 2* courses, which primarily focused on paragraph writing. Although class selection remained random, randomization at the individual level was limited to protect the quasi-experimental research design. The Experimental Class (EC), comprising 42 students, underwent an intervention during which they used ICT tools to improve essay writing. Meanwhile, the Control Class (CC), consisting of 37, continued with standard teaching procedures without using the ICT. This design allows for a comparative evaluation of the effectiveness of the proposed model against other approaches that do not adopt such tools. The sample size (n = 79) provided sufficient statistical power to detect medium to large effects, as supported by the plausible and relatively narrow confidence intervals used in the effect size estimations. The use of intact

classrooms rather than random assignment is a methodologically sound approach in educational research, where manipulating the natural learning environment may introduce confounding variables. In particular, this study employed intact classrooms within a quasi-experimental design to minimize selection bias, as evidenced by the nonsignificant differences in pre-test scores between the groups ($p = 0.832$; see Table 6). This approach enhances both internal and ecological validity, though certain trade-offs are acknowledged in terms of generalizability.

Table 1
Demographic Information of the Participants

	Frequency	**Percent**
Gender		
Male	24	30.4
Female	55	69.6
Age group		
18-19	3	3.8
20-22	73	92.4
Over 22	3	3.8
Types of technical devices you have used to learn English		
Desktop computer	6	7.6
Laptop	33	41.8
Smart phones	40	50.6

3.3 Data collection instruments

3.3.1. Pre- and post-writing tests

The writing task following a proficiency exam serves as an assessment whose purpose is defined in alignment with predefined criteria and this ensuring that the data collected is standardized and consistently measured across all the participants (Creswell & Guetterman, 2019). Accordingly, this research employed a pre-test and post-test design involving the participants to collaboratively write cause-and-effect essays in ICT-supported environment. The writing tasks were adopted from VSTEP (Vietnamese standardized test of English proficiency test) practice materials. Cause-and-effect essays are among the written genres that the VSTEP test takers must become familiar with in order to successfully complete the writing test. Each essay was 250 words long and was completed in 40 minutes by both EC and CC students.

The VSTEP scoring criteria, including task achievement, organization, grammar, and vocabulary, which are made public by the Vietnamese Ministry of Education and Training were used to evaluate the writing skill component of the test. To ensure the validity and reliability of the assessment, a dual evaluation methodology was employed. All handwritten pre- and post-test essays were scanned, digitalized, and preliminarily marked with LexiBot, an automated essay assessment tool that had been developed to align with VSTEP evaluation standards across the four dimensions, ensuring a consistent application of scoring criteria. To validate the automated scoring process, two trained human raters independently assessed all essays using the official VSTEP analytical rubric. In cases where a discrepancy greater than 1 point in the 10-point scale occurred between the human raters or between the average human score and the LexiBot score, a third experienced rater reviewed the essays and resolved the discrepancy. This integration of machine and human scoring enhanced both the reliability and

validity of the writing assessment. The automated scoring system minimized potential inconsistencies resulting from by rater fatigue or subjective biases, while human raters provided critical validation of the automated scores and ensured accurate assessment of higher-order writing skills that automated scoring systems may not fully capture.

3.3.2 Questionnaire

The questionnaire as a vital tool in analyzing factors related to a situation, such as attitude, perception, experience, or behavior (Creswell & Guetterman, 2019) was employed to gain insights into students' attitudes regarding the use of ICT in the CW process. It was structured into two segments sections: one collecting the participants' demographic information and the other exploring their perceptions of adopting ICT tools in collaborative writing of cause-and-effect essays.

The questionnaire was formulated systematically to test both content and measurement uniformity. The measurement of students' attitudes, perceptions, experiences, and behaviors related to ICT use in collaborative writing was achieved by adapting validated items from Maita (2021), Nguyen (2019), and Olives (2019). Content validity was preserved by incorporating previously validated measurement tools and refining the items to align with the specific context of cause-effect essay writing. Section 2 of the instrument organizes the data into four thematic clusters, each targeting a distinct yet interconnected construct: (1) overall attitudes toward collaborative writing, (2) perceptions of ICT-mediated writing process, (3) personal experiences with collaborative writing, and (4) anticipated behaviors in future writing tasks. This section utilizes a Likert scale to measure the degree of agreement or disagreement with 19 items related to ICT use in CW. The major part of the questionaire has 4 main themes:

The first theme contains items (i2, i4, i10, i14), exploring the participants' general perceptions of CW in English as a foreign language (EFL CW). These items deal with the foundational dimensions that provide insight into students' perceptions of themselves as EFL writers and their feelings in participating in peer writing activities.

The second cluster of items examines the students' perceptions of the ICT-supported CW process (i1, i6, i7, i11, i13, i16, i19). These items involve with how ICT tools were integrated with and altered the CW process. The items cover both the technical aspect of facilitation (e.g., ease of access to digital collaboration or materials) and the pedagogical benefits. The items reflect the natural progression of the writing process itself, from the planning, pre-writing, to initial drafting, revision and feedback phase and the production stage.

The third theme seeks for the participants' views on the collaboration in CW with ICT support (i3, i8, i12, i15, i17, i18). The items are developed following on two key aspects of ICT-supported collaboration. On the social-emotional level, they evaluate how technology increases student feelings of connection to their fellow students while writing, fosters a supportive environment in which to learn. Practically, the items evaluate tangible results in CW.

The last cluster contains 2 items that explore the participants' expectations for ICT-supported CW (i5, i9), allowing a further understanding of the participants' (dis)satisfaction with their technology-enhanced CW experience and their outlook on the future CW (See Appendix for full form of the questionnaire).

To ensure clarity, relevance, and comprehensiveness, the instrument underwent a pilot test involving 15 participants from the experimental cohort and was reviewed by two English lecturers. Based on the feedback, necessary revisions were made. Internal consistency analysis using Cronbach's alpha yielded a value of 0.925, indicating a high level of reliability across the 19-item questionnaire. This suggests that the instrument effectively captures multiple dimensions of students' experiences with ICT-supported collaborative writing with a high degree of accuracy.

3.3.3 Semi-structured interview

This research utilized semi-structured interviews to generate qualitative data regarding the application of ICT in CW. These interviews allowed the researchers to seek more than what is offered in the structured questionnaires. In the interviews, the participants' responses were guided by the set of interview questions. This approach is to allow the participants to speak in depth, moving beyond the interview structures and producing richer and broader data (Creswell & Guetterman, 2019).

In this study, the choice of interviewees was made on the basis of post-writing test scores. The procedure involved selecting top five students with the highest scores and the other five with the lowest scores to have a variety of opinions on the effectiveness of the intervention. This selection strategy captures diverse viewpoints and experiences, thereby enhancing the construct validity of the study by illustrating how the intervention affected different populations of students. The interview was administered such that that each participant was assigned a specific time to log in and meet with the researchers via Google Meets. This arrangement facilitated real-time interactions with the participants and thus allows immediate clarifications whenever necessary. Consent forms were also signed before the interviews to ensure the participants' anonymity and their agreement, which is meant to aid in the clarity of the later word-for-word analysis.

In order to increase the reliability of the data obtained from the interviews, a pilot study was conducted in which the prepared initial questions were improved after discussion with both the interviewees and the educated population. Recorded files of the interviews helped enhance reliability by allowing the verification of accuracy of each interview.

3.4 Intervention: Integrating ICT into CW of cause-effect essays

Both the EC and CC students participated in 5-stage writing lessons, including Planning, Drafting, Revising, Editing, and Publishing; and focused on cause-effect essays. Table 2 indicates the differences when utilizing the CW process in two groups of participants.

Table 2
The Differences of the Intervention Between the EC and CC

Stage	The EC	The CC
Planning	LMS and Padlet for digital resource sharing and brainstorming	Course book for printed materials and notes
Drafting	Google Docs for real-time collaboration and feedback	Individual drafting with peer discussions
Revising	Google Docs peer review with comments	Manual peer review with notes
Editing	Grammarly for automated suggestions	Manual editing on peers
Publishing	LMS for digital submission	Paper-based submissions

The key disparity of the intervention between two groups of participants is that the EC students received the support of ICT platform and tools for collaboration and feedback, enhancing interactivity and efficiency. Meanwhile, CC relied more on more traditional and manual methods.

The intervention activities were implemented in a systematic sequence throughout all CW sessions.

During the planning phase, the EC students used the LMS and Padlet to download, share digital resources, and collaboratively brainstorm. The EC students posted their initial ideas on the essay topic to a shared Padlet board, commented on each other's contributions, and collaboratively organized

these ideas into coherent categories. Meanwhile, the EC participants engaged in similar brainstorming activities, using printed and handwritten notes, which they later shared during in-class discussions.

During the drafting phase, Google Docs was employed by the EC to facilitate real-time collaboration. The groups created shared documents that allowed all members to contribute simultaneously to different sections of the essay. The commenting function enabled students to provide immediate feedback on their peers' writing while maintaining a transparent record of contributions and revisions. In contrast, the CC students composed their drafts individually on paper and later discussed them in person to compile a final version.

In the revision stage, the EC used the commenting and suggesting features of Google Docs to provide peer feedback. Each student was required to comment on the work of at least two peers, with emphasis on content development, organization, and language use. The CC students exchanged paper drafts and wrote comments directly on those papers. The EC participants utilized Grammarly as a support tool for identifying grammatical and mechanical errors, while the CC participants manually edited their peers' work.

Finally, the EC submitted their final drafts as completed essays via LMS, whereas the CC submitted their final drafts in hard copy format.

3.5 Data analysis

All quantitative data were analyzed using SPSS version 27.0. Baseline (pre-test) and post-intervention assessments were conducted to evaluate changes in students' ability to write cause–effect essays. Mean scores from the pre- and post-tests were compared both within and between groups using paired-sample and independent-sample t-tests. These statistical tests were deemed appropriate for examining the magnitude of change between related datasets (Greasley, 2008).

To address the second research question, descriptive statistical analysis of the questionnaire data was also carried out using SPSS. This included the calculation of arithmetic means and standard deviations for each questionnaire item, providing insights into students' perceptions of the role of ICT in collaborative writing (CW) tasks, particularly in the context of cause–effect essay writing. The internal consistency of the questionnaire was high, as indicated by a Cronbach's alpha coefficient of 0.925.

In addition to significance testing, the study employed effect size calculations to assess the practical significance of the observed differences. Cohen's d was used as a standardized measure for both paired and independent samples, with values of 0.2, 0.5, and 0.8 representing small, medium, and large effects, respectively (Cohen, 1988). To address potential biases arising from small sample sizes, Hedges' g was also calculated. Furthermore, Glass's delta was used to estimate effect sizes for comparisons involving independent samples. For each effect size, 95% confidence intervals were computed to provide more precise estimates and enhance the interpretability of the findings.

The thematic analysis mode in Creswell's (2013) Data Analysis Spiral Model was used for qualitative data analysis. This model consists of six interrelated subprocesses: Data collection, Data management, Reading and reading notes, Statistics and classification, Interpretation and Representation, and Visualization. Each stage builds from the last, presenting a comprehensive structure for qualitative data analysis. Also supported in the analysis was MAXQDA™ Analytics Pro 2020, a software that facilitates the analysis of considerable qualitative data usually employed in research (Kuckartz & Rädiker, 2019).

The researchers identified and classified the textual data into four thematic categories reflecting participants' perceptions: (1) giving and receiving comments in CW; (2) the CW process with ICT support; (3) collaboration in ICT-based writing; and (4) their expectations. These themes were then further specified, as illustrated in Table 3.

Table 3
Themes and Sub-themes Coding for Qualitative Data Analysis

Themes	Sub-themes	Examples of students' quotes
Giving and providing comments in CW	Having faith in peers' comments	*It is like having multiple mentors all working by your side and giving you good advice.*
	Gaining confidence in giving feedback	*I think it's normal to doubt my own words when I see other people writing and thinking differently. But after some peer reviews, I feel confident that I can do this again and better.*
	Improving accuracy	*When my classmates comment on drafts that I write, I know what is incorrect and [what] needs correction […] so I check again to improve it.*
	Having access to specific comments	*I like it when teachers and classmates leave me specific feedback on my drafts using Google Docs. It also means that I will know what I need to work on. I want [it] and appreciate that, as a student.*
	Facilitating revision work	*Drafting essays using Google Docs is more convenient because I can re-position sections easily and get feedback from my classmates without delay.*
	Having access to instant feedback	*Feedback from my classmates is nearly instantaneous and I can read it at once.*
	Facilitating feedback provision	*I can leave comments on my friend's work even outside of class time.*
	Facilitating brainstorming and generating ideas	*Via Padlet, I could brainstorm and generate ideas visually before starting to write the whole essay.*
	Facilitating access to learning materials	*I can access the materials everywhere, just with laptop and the Internet.*
	Enhancing motivation	*When I post my completed essays on various tools, I feel good. It is motivating to see so much effort put into my work on that project.*
Collaboration in CW with ICT	Improving writing performance	*Since these tools were used [collaboratively], my writing competence has undoubtedly improved.*
	Becoming more engaged	*[…] powering screens and asserting, collaborating through discussion and annotation tools, makes me more active in class working with my classmates.*
	Becoming more aware of strengths and weakness	*With these [comments combined with track changes and real-time chat features and detailed, constructive feedback], you understand more specifically what needs to be improved […] and what you are good at.*
Expectation	Continuity with ICT	*They assist with structuring ideas and making sure that people work well together, and so I want to keep using these tools with the next assignments.*

4 Findings

4.1 The impacts of ICT-supported CW on students' writing cause-effect-essay performance

4.1.1 The differences of the EC and CC students' scores before and after the intervention

The paired samples test results for the EC and CC in Table 4 reveal significant differences in scores before and after the intervention.

Table 4
The Comparison of the Pre- and Post-writing Tests of the EC and CC

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	EC-post - EC_pre	.8095	.5405	.0834	.6411	.9779	9.707	41	<.001
Pair 2	CC_post - CC_pre	.1757	.3166	.0520	.0701	.2812	3.375	36	.002

Regarding the EC group scores, the mean difference between the pre-test and post-test scores is 0.8095, indicating a significant improvement post-intervention. The p-value of 0.000 confirms the statistical significance of this gain, illustrating the intervention's positive impact on students' cause-effect essay writing performance, particularly those of the EC group.

For the CC group, the mean difference of 0.1757 also indicated some improvement though it was less pronounced than the EC group. The p-value of 0.002 also showed a significant relation, albeit to a lesser extent than the EC group. Some improvement was seen in the CC group, but the intervention was observed to be more effective in the EC group.

Table 5
The Paired Samples Effect Sizes

			Standardizer[a]	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	EC-post - EC_pre	Cohen's d	0.5405	1.498	1.051	1.936
		Hedges' correction	0.5455	1.484	1.041	1.918
Pair 2	CC_post - CC_pre	Cohen's d	0.3166	0.555	0.205	0.898
		Hedges' correction	0.3199	0.549	0.203	0.889

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

An analysis of effect sizes evaluated the dimension of score differences between the pre-test and post-test periods (Table 5). The intervention delivered substantial practical effectiveness to participants, as highlighted by an effect size value of Cohen's d at 1.498 with a 95% confidence interval extending from 1.051 to 1.936. The control participants achieved an effect size of medium magnitude (Cohen's d = 0.555, 95% CI [0.205, 0.898]). The EC that exhibited stronger effect sizes reveals that ICT enhanced CW

and substantially influenced students' performance enhancement compared to traditional instructional methods.

4.1.2 The Differences of the pre- and post-writing scores within the EC and CC

The independent samples test results provided insights into the differences in scores within the EC and CC before and after the intervention, which is demonstrated in Table 6.

Table 6
The Comparison within the EC and CC before and after the Intervention

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
									95% Confidence Interval of the Difference	
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Pre	Equal variances assumed	1.245	.268	.213	77	.832	.0376	.1765	.3138	.3891
	Equal variances not assumed			.212	74.023	.832	.0376	.1773	.3157	.3910
Post	Equal variances assumed	0.40	.842	3.440	77	<.001	.6715	.1952	.2828	1.0602
	Equal variances not assumed			3.458	76.824	<.001	.6715	.1942	.2848	1.0582

There was no significant difference in the pre-test results of both groups, as evidenced by the mean difference of 0.0376 and the p-value of 0.832. This suggests that there was no difference in the performance of the two groups before applying the intervention. Despite this initial similarity, the post-intervention test results showed a big difference, with the EC group having much greater improvement in comparison with the CC group. The mean difference is 0.6715 with a p-value of 0.001 under the assumption of equal variances, confirming a statistically significant difference between two groups after the implementation of interventions. The results are of statistical significance, emphasizing the effectiveness of the intervention, demonstrating that the collective adoption of ICT tools enhances students' collaborative essay writing.

The effect size analysis established through Table 7 showed that groups remained equivalent at the pre-test with a negligible difference of Cohen's d = 0.048 (95% CI [-0.394, 0.490]). The results showed a substantial impact (Cohen's d = 0.776, 95% CI [0.315, 1.232]) when comparing groups post-intervention. This result was further supported by Hedges' *g* (0.768) and Glass's Δ (0.811), both of which reinforced the magnitude of the effect. These substantial effect sizes highlighted the significant educational impact of the intervention on the EC compared to the CC.

Table 7
Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	**Point Estimate**	**Lower**	**Upper**
Pre	Cohen's d	0.7828	0.048	-0.394	0.490
	Hedges' correction	0.7905	0.048	-0.390	0.485
	Glass's delta	0.8126	0.046	-0.396	0.488
Post	Cohen's d	0.8658	0.776	0.315	1.232
	Hedges' correction	0.8743	0.768	0.312	1.220
	Glass's delta	0.8281	0.811	0.326	1.286

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

4.2 Students' perceptions of using ICT in CW activities

Data to answer the second research question on the students' perceptions of utilizing ICT tools in CW process of writing cause-effect essays were collected by means of questionnaire distributed to 42 students of the EC groups and interviews with 10 students of the same group.

Regarding the students' perception of EFL CW in general, the participants in EFL writing courses showed a positive attitude towards collaborative activities, as seen in their preference for pair or group activities in writing (M=3.45). However, the relatively moderate mean (M=2.86) for students' self-perception as English writers showed that many students were still developing their writing identity. This score indicates that students were engaged in becoming competent EFL writers but may not yet had complete confidence in their writing capabilities. Lastly, readers should consider this transitional state of writing identity development in their design of education support mechanisms.

As seen in Table 8, highly encouraging results were achieved in peer interaction and feedback processes. The high mean score (M=3.55; M=3.43) in comfort in activity level and searching for suitable words and ideas from peers for the students indicated their tremendous faith in them to connect with peers for support in writing. It additionally suggests that the affordances of ICT-based collaborative platforms and tools successfully enhanced student engagement in comparison to conventional, traditional instruction methods. This enhanced engagement, however, should not be viewed merely as an endpoint but rather as a crucial mediating mechanism through which ICT tools influence writing performance. Engagement is a dynamic construct that can be shaped by instructional interventions, and in turn influence learning outcomes (Fredricks et al., 2004). The proposed pathway involves suggests that ICT integration enhanced engagement, which subsequently contributed to improved writing performance.

The same interpretation is supported by the correlation between engagement indicators and students' self- assessed writing improvement (M=3.45), as well as by qualitative interview data in which students explicitly connected their increased engagement to writing development. This aligns with Vygotsky's (1978) sociocultural theory, wherein ICT tools could be viewed as modern mediational means capable of transforming social interaction, thereby making the collaborative process more engaging and conducive to cognitive development in writing. While the limitations of the cross-sectional design were acknowledged, especially its inability to establish causal relationships, theoretical considerations and empirical findings strongly supported the dual roles of engagement, both as outcome of ICT-enhanced instruction and as a mediating factor that influences writing performance. Moreover, the willingness of students to examine their essays and receive feedback from their peers also reached quite a high level

(M=3.60). The results showed that the students not only acknowledged the role of peer collaboration and feedback in their writing development, but also actively engaged in these practices as an essential part of the writing process.

Table 8
Students' Perceptions of Using ICT in CW Activities

	N	Min	Max	Mean	Std.
I can get access to the learning materials easily with ICT - supported CW activities.	42	3	5	3.57	.590
I like to work in pairs or groups in EFL writing class.	42	2	4	3.45	.550
I feel more connected to my peers in CW activities with support from ICT tools.	42	3	4	3.50	.506
I think I am a truly English writer.	42	2	5	2.86	.718
I hope to receive more personalized feedback on my writing from both peers and teachers through the use of ICT tools in CW activities.	42	2	5	3.64	.727
I hope to be able to continue using ICT tools in CW activities in the future.	42	3	5	3.64	.533
I can trust myself to find good words and ideas to give comments on my peers' essays in CW.	42	2	5	3.43	.590
I can assist my peers easily by giving feedbacks and comments on their essays in ICT-supported CW activities.	42	2	5	3.50	.634
I can complete an assigned writing task within the given amount of time in CW activities with support from ICT tools.	42	2	5	3.55	.739
I can edit my essays based on my peers' comments with ICT in CW activities.	42	3	5	3.57	.630
I can trust my peers' comments on my essays in CW.	42	3	5	3.60	.587
I can learn from my peers while working collaboratively with support from ICT tools.	42	3	5	3.71	.708
ICT apps integrated in the CW activities help to improve my essays' accuracy, and readability.	42	3	5	3.62	.582
Collaboration via ICT tools helps me to become active in writing activities.	42	3	5	3.55	.550
My writing performance has improved through the CW activities with support from ICT tools.	42	3	5	3.45	.550
Sharing my final essays on ICT platform in CW activities enhances my sense of accomplishment and motivation.	42	2	4	3.43	.547

Interviews with students helped understand these quantitative results better. Several students highlighted various benefits of CW experiences. A participant, for example, said: *"I was able to learn new ideas and [new] ways to express them because I was working in a group."* It means that the student illustrated how group work facilitated idea-generating skills. Another student added:

> *"I think it's normal to doubt my own words when I see other people writing and thinking differently. But after some peer reviews, I feel confident that I can do this again and better."*

This points to the encouraging nature of the comments and evaluation of peers to the students and their self-esteem as competent English writers. In other words, the student revealed how peer-review process contribute to building their writing confidence gradually.

Regarding the CW process with ICT, technological tools were perceived as providing easier access to learning resources with high availability of leaves within a week (M=3.57) and enhancing the ability to generate and structure ideas more (M=3.43). Drafting cause-effect essays using the ICT apps (M=3.55) was also considered more accessible for the students, and they also embraced the feedback notification tabus, which allowed them to help others (M=3.50). As shared by a participant in the interview data:

> *"Drafting essays using Google Docs is more convenient because I can re-position sections easily and get feedback from my cclassmates without delay."*

This feedback corroborated the quantitative data, which stresses the flexibility and quickness of feedback essential for drafting and revising essays among the stages requiring ICT input. Cause-effect essay-based editing obtained from peer comments and ICT-based corrections on essays were also appreciated (M=3.57 and 3.62, respectively). Qualitative analysis supported this point as shown in the following remark by a participant: *"When my classmates comment on drafts that I write, I know what is incorrect and [what] needs correction."* This comment highlighted the significance of peer feedback in the revision process of drafts. ICT also increased the students' satisfaction and motivation when posting submissions of final essays on ICT platforms (M=3.42). A high-scoring participant in the post-test stated: *"When I post my completed essays on various tools, I feel good. It is motivating to see so much effort put into my work on that project."* This feeling showed the positive aspect of using ICT in the writing process. It allowed students to present their completed work to an audience and gain appreciation for their efforts.

In terms of collaboration in CW with ICT, the result revealed strong positive perceptions of ICT-enhanced CW experience. The participants' responses showed their acknowledgment of the teacher or classmates offering help when they needed it (M=3.50). A participant commented on the diverse support from collective adoption of ICT tools and its positive impact on her engagement:

> *"... powering screens and asserting, collaborating through discussion and annotation tools, makes me more active in class working with my classmates. It is easier to talk about and change things at once, which is what I need to improve my writing."*

One student explained the benefits they had from adequate and prompt feedback during the process of writing cause-effect essays with ICT tools support.

> "Comments combined with track changes and real-time chat features allow us to get much more detailed and constructive feedback than many traditional methods. With these, you understand more specifically what needs to be improved."

It illustrated how ICT facilitated real-time collaboration and improvements in writing. Additionally, the textual data demonstrated the immediacy and accessibility of feedback through ICT which is regarded as a fundamental theme in the interview. Another participant added: "*Having feedback of such immediacy helps me to know what I did well and what I need to work harder on. It's like there is a teacher [or an assistant] to ask for help whenever necessary."* This comment highlighted the increased interpersonal interaction and relationships potential ICT tools create, which aligned with the quantitative findings.

Quantitative findings about improved quality of writing and collaborative advantages were further supported by qualitative evidence. The synergy between peer learning and technology was particularly evident in another student's comment. A student reflected:

> "*Since these tools were used [collaboratively], my writing competence has undoubtedly improved. I got more committed to watching other people write and getting their opinions....*",

or:

> *"It is good to see others' writing processes in real-time through shared documents, so I learn new writing methods and approaches I can adopt eventually […]. It is like having multiple mentors all working by your side."*

These data directly related to the high mean scores for peer assistance observation (M=3.71) and writing quality improvement (M=3.45).

As for the participants' expectations for ICT-supported CW, the analysis showed students' high expectations for technology-facilitated writing. The results from the quantitative data demonstrated high expectations of ICT utilization for personalized feedback on CW activities (M=3.64). The qualitative data from student interviews complemented these quantitative findings. Students emphasized the value of specific, technology-enabled feedback, as illustrated by one participant's comment:

> "*I like it when teachers and classmates leave me specific feedback on my drafts using Google Docs. It also means that I will know what I need to work on. "I want [it] and appreciate that," as a student."*

This sharing proved the high mean score for personalized feedback expectations as students recognized the role of ICT as a policy of detailed writing guidance.

In addition, the findings showed that ICT integration in future CW activities received a high commitment (M=3.64). Qualitative data from student interviews illuminated these expectations as expressed by a student: "*They assist with structuring ideas and making sure that people work well together, and so I want to keep using these tools with the next assignments*." Furthermore, another student's remark clearly captured the contrast between standard and ICT-enhanced writing instruction approaches: *"We are too familiar with the traditional way that do not use any practical tools to write. I hope that we will still use the ICT tools in class. It is a shorter and more fun writing process."* Consequently, it indicated that students' future expectations for ICT may also be reflected in its promise to impact the writing process to create positive effects and interest.

5 Discussion

5.1 The impacts of ICT-supported CW on students' writing cause-effect-essay performance

In terms of the differences of the EC and CC students' scores before and after the intervention, the significant mean difference between the pre- and post-test indicates a positive impact on EC students' cause-effect essay writing performance. The finding aligns with the studies by Nguyen (2019) and Maita (2021), which demonstrated that technology facilitated peer collaboration and enhances students' writing abilities in real-time. Besides, the differential impact observed in this study between the EC and CC groups highlighted the additional benefit of the use of ICT in enhancing the learning environment, making it more accommodative and encouraging. This is also supported by Do et al. (2022), who insisted that the use of various ICT tools and platforms increased students' engagement and motivation.

Regarding the differences of the pre- and post-writing scores within the EC and CC, no significant difference in the pre-test results of both groups, which means there was a similar baseline between the groups before the intervention. This result aligns with Maita (2021), which highlighted the parallel starting competencies before the implementation of the intervention with ICT. However, there was a big difference between two groups in the post-test, which indicated the effectiveness of the intervention of the collective adoption of ICT to enhance EC students' collaborative essay writing.

While both the EC and CC showed statistically significant improvements in their writing scores, it is important to address the question of causal attribution and internal validity. The improvement observed in the CC (M=0.1757, p=0.002) likely reflects the natural learning progression that occurred through traditional writing instruction, as students in this group still engaged in the standard five-stage writing process and received conventional feedback. This expected improvement in the control condition is consistent with previous research demonstrating that structured writing instruction generally yields

positive outcomes regardless of delivery method (Storch, 2005; Elola & Oskoz, 2010). However, the substantially larger improvement in the EC (M=0.8095, p<0.001) and the significant between-group difference in post-test scores (M=0.6715, p<0.001) provided compelling evidence for the added value of the ICT intervention beyond standard instruction. The effect size analysis further strengthens this causal inference, with the EC demonstrating a significant effect compared to the medium effect in the CC. This difference in magnitude (nearly three times larger) strongly suggests that the ICT-supported CW approach contributed unique benefits beyond those attributable to general instructional effects.

The observed improvement in both the EC and CC is a critical issue that warrants serious consideration of the role of the intervention. Rather than viewing ICT platforms and tools as inherently transformative, the results pointed to a more nuanced understanding of the technology as an amplifier of collaborative processes, rather than as an agent of radical change in and of itself. This perspective stood in contrast to the binary framing often found in studies on education technologies. It aligned with Elola and Oskoz's (2010) view that digital technologies function as supplements rather than replacements for sound pedagogical practices. The incremental gains observed in the EC raised important questions about what specific aspects of ICT-facilitated collaboration most significantly influenced writing outcomes; Whether it was the immediacy of feedback, the multimodal nature of the interaction, or perhaps a reduction in cognitive load during the writing task. The data particularly highlighted the affordances of ICT tools, such as instant feedback and iterative revision, which appeared to be especially impactful. This is supported by students' qualitative responses, which emphasized the tools' capacity to deliver more detailed and constructive feedback through features like real-time chat. Nevertheless, the gain made by the CC indicated that the traditional forms of CW remained pedagogically relevant. As Storch (2005) observed that, face-to-face CW continues to have a significant effect in L2 writing development. This interpretation complicated any simplistic claims of technological superiority and instead supports a more integrated view - one in which effective writing pedagogy remained central, and technology serves as a powerful, context-dependent enhancer of the collaborative process.

Several aspects of the research design strengthen the interpretation of the findings, although the limitations in establishing causality are duly acknowledged. First, the use of intact classrooms within a quasi-experimental framework helped minimize selection bias, as evidenced by the non-significant differences in pre-test scores between the groups (p=0.832). Second, both groups were instructed by the same teacher, who delivered identical content and writing stages, with the only systematic variation being the integration of ICT tools. This helped isolated the variable of interest, while recognizing that perfect isolation was not attainable in educational settings. Third, the short duration of the intervention reduced the likelihood that external factors or general developmental trends account for the differential improvement. Finally, triangulation of quantitative results with qualitative interview data offered converging evidence, indicating that students attributed their progress to features specific to the ICT-supported approach, such as real-time collaboration and immediate feedback. Although perfect causal attribution was inherently challenging in educational contexts where multiple variables interacted, the pattern and magnitude of the findings when considered alongside these methodological controls strongly supported for the conclusion that ICT-supported CW contributed substantially to the enhanced performance observed in the EC, beyond what would be expected from standard instruction alone. Rather than asserting definitive causal effects, these findings are better interpreted as meaningful observed differences between instructional approaches, meriting further investigation through more rigorously controlled experimental designs in future research.

5.2 Students' perceptions of using ICT in CW activities

Overall, the findings demonstrated how the strategic integration of ICT tools can transform CW practices. While previous studies have often focused on single-purpose technologies, the present study adopts a

multi-tool framework, offering a broader perspective on how emerging technologies support the complex ecology of CW.

Firstly, the observed improvement in writing performance aligns with sociocultural theories of writing development. Drawing on Vygotskian perspectives (1978) of mediated learning, the findings suggest that ICT tools provided both cognitive and social mediation in CW environments. These tools restructured the collaborative space in ways that traditional methods could not, fostering collective scaffolding - a shared support system where the immediacy, availability, and effectiveness of peer interaction became highly visible (Donato, 1994). This represents a theoretical contribution by showing how digital mediation can enhance the social dimension of writing, a central concern of sociocultural theory.

Secondly, the study addresses a gap in writing pedagogy, particularly in the context of ICT integration, by demonstrating how technology can simultaneously support both genre-based and process-oriented aspects of instruction. The digital tools facilitated iterative revision and helped students internalize genre conventions, effectively operationalizing the process-genre integration proposed by Badger and White (2000), which has often been challenging to implement in practice. This contribution is especially relevant in EFL contexts, where a balanced approach between process and genre is critical.

Thirdly, the study highlights the dual role of engagement as both an outcome and a mediating factor, offering a more nuanced understanding of technology's impact than typically found in educational technology research. This finding is consistent with engagement model shaped by Fredricks et al. (2004) that instructional interventions influenced learning outcomes. Rather than framing ICT as inherently transformative, the findings suggest a more grounded view in which technology enhances CW outcomes by promoting deeper social interaction. This shifts the narrative from a deterministic view of technology to an ecological perspective that considers the interplay among tools, pedagogical strategies, and social dynamics.

Finally, in terms of instructional practice, the findings indicate that a deliberate and purposeful combination of ICT tools throughout different stages of the writing process may be more effective than either traditional instruction or the use of isolated technologies. This has important implications for curriculum development and teacher training, underscoring the need for pedagogical frameworks that guide the intentional integration of digital tools into CW instruction. The participants reported high commitment to the future experience with ICT when writing collaboratively. Do et al. (2022), and Nguyen and Trang (2023) also stated such a situation, where students were reported to participate more and work with each other in the class environment through platforms like Padlet. The students expressed pleasure and accomplishment when utilizing the ICT tools for CW as observed in Im and Lee's (2022) study.

6 Conclusion

This research has determined that collectively incorporating ICT tools in cause-effect essay CW had positive impacts on both students' writing and their perceptions. The ICT tools also promoted engagement and effective, diverse peer interactions in the writing process. The students appreciated ICT tools because they provided them with skills for idea structuring, resource sourcing, and active interactions with their peers. Within the research framework, engagement emerges as both as an outcome of ICT-aided CW and as a mediating factor influencing writing performance. The data show that the technological affordances of ICT tools heightened student engagement in the EC group, as reflected in higher self-reported participation and focus during the writing tasks. This elevated engagement contributed to writing outcomes. To this end, Vygotsky's (1978) sociocultural theory is particularly relevant, highlighting learning as a socially mediated process facilitated by ICT tools and platforms. These tools enabled more dynamic peer interactions and the creation of an extended ZPD, where students supported each other's writing development. The digital environment reinvented the social dimension

of writing, making the process more interactive and cognitively enriching. Qualitative findings reinforce this view, with students attributing learning gains to real-time feedback and collaborative commentary-practices closely aligned with Vygotskian concepts of scaffolding and co-construction. While the cross-sectional design limits causal inference, the alignment of findings with sociocultural theory provides a strong conceptual basis for understanding how ICT-supported CW fosters engagement and enhances writing performance. The findings of the current study also suggest that as research on CW continues to evolve, the sociocultural theory remains a robust theoretical foundation for explaining how and why this approach proves highly effective in fostering language and writing development. Therefore, EFL writing teachers should adopt different ICT tools and platforms in their writing instructions. The use of different ICT tools complementary to one another should also be encouraged. The curriculum developers of professional development programs for EFL teachers also need to take into account the benefits that the collective use of ICT in writing instruction can offer so as to integrate ICT supported writing instruction literacy into their programs.

Despite its helpful findings, the present study has several limitations. First, the participants were drawn from a single educational context, and the analysis relied solely on descriptive statistics, paired-sample *t*-tests, and independent-sample *t*-tests. As a result, the generalizability of the findings beyond the specific context of this study may be limited. In addition, the study was conducted over a short period with no follow-up aiming at investigating the longitudinal effects on writing skills. Future studies need to tackle these issues so provide more insightful knowledge about the use of ICT in English language education.

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Appendix

Questionnaire used in the present study.

The purpose of this questionnaire is to gather information about your perception of using ICT in collaborative writing (CW) of cause-effect essays.

Please complete the questions as accurately and honestly as possible. All the information you provide will be used solely for research purposes, and your personal information will be kept confidential.

SECTION 1. DEMOGRAPHIC INFORMATION

1. Gender: □ Male □ Female □

2. Age group: □ 18-19 □ 20-22 □ Over 22

3. Types of technical devices you have used to learn English:

□ Desktop computer □ Laptop □ Smart phones

SECTION 2: STUDENTS' PERCEPTIONS

Please indicate how much you agree and disagree with each of the statements by ticking the suitable choice.

1 = Strongly disagree 2 = Disagree 3 = Neutral

4 = Agree 5 = Strongly agree

No.	Statement	1	2	3	4	5
1	I can get access to the learning materials easily with ICT - supported CW activities.	□	□	□	□	□
2	I like to work in pairs or groups in EFL writing class.	□	□	□	□	□
3	I feel more connected to my peers in CW activities with support from ICT tools.	□	□	□	□	□
4	I think I am a truly English writer.	□	□	□	□	□
5	I hope to receive more personalized feedback on my writing from both peers and teachers through the use of ICT tools in CW activities.	□	□	□	□	□
6	I can brainstorm and organize ideas with my peers for the essays better with ICT tools in CW activities.	□	□	□	□	□
7	I can manage to draft my essay easily with ideas generated on ICT apps in CW activities.	□	□	□	□	□
8	The immediate feedback possible through ICT tools in CW activities helps me understand my strengths and areas that need improvement in writing essays.	□	□	□	□	□
9	I hope to be able to continue using ICT tools in CW activities in the future.	□	□	□	□	□
10	I can trust myself to find good words and ideas to give comments on my peers' essays in CW.	□	□	□	□	□
11	I can assist my peers easily by giving feedbacks and comments on their essays in ICT-supported CW activities.	□	□	□	□	□
12	I can complete an assigned writing task within the given amount of time in CW activities with support from ICT tools.	□	□	□	□	□
13	I can edit my essays based on my peers' comments with ICT in CW activities.	□	□	□	□	□
14	I can trust my peers' comments on my essays in CW.	□	□	□	□	□
15	I can learn from my peers while working collaboratively with support from ICT tools.	□	□	□	□	□
16	ICT apps integrated in the CW activities help to improve my essays' accuracy, and readability.	□	□	□	□	□
17	Collaboration via ICT tools helps me to become active in writing activities.	□	□	□	□	□
18	My writing performance has improved through the CW activities with support from ICT tools.	□	□	□	□	□
19	Sharing my final essays on ICT platform in CW activities enhances my sense of accomplishment and motivation.	□	□	□	□	□

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