



# Exploring the effectiveness of digital writing tools on Thai EFL students' writing

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## ABSTRACT

Mastering writing in English is crucial for English as a foreign language (EFL) learners; nevertheless, they encounter numerous difficulties, such as idea development, grammar complexities, vocabulary range, or even the pressure from writing anxiety. Consequently, many educators employ digital writing tools to enhance EFL learners' English writing skills. This study aimed to explore Thai EFL university students' perceptions of two digital writing tools, Paragraph Punch and ProWritingAid, as well as to investigate students' writing performance. Participants consisted of 53 undergraduate EFL students enrolled in English education at a university in Thailand. Three research instruments were utilized: a 30-item questionnaire investigating participants' perceptions of writing problems, a pre- and post-writing test assessing students' writing development, and a semi-structured interview exploring students' views on integrating digital writing tools in writing classes. The questionnaire findings emphasized various challenges students encountered in writing, including difficulties with idea development, grammar, and paragraph organization. The research further indicated a significant enhancement in students' writing abilities after using digital writing tools. Additionally, students perceived that the improvements in their writing proficiency were due to the supportive guidance and real-time feedback provided by these digital writing tools. Nevertheless, there were concerns regarding excessive dependency on digital tools, the need for supplementary teacher feedback, and technological barriers.

**Keywords:** EFL, digital writing tools, technology integration, Paragraph Punch, ProWritingAid, writing skills

## INTRODUCTION

In the dynamic global context, effective English communication is crucial to access a world of information and technological advancements, free from geographic boundaries (Rao, 2019). Moreover, English unlocks the gateway to professional possibilities and acts as a bridge for promoting cross-cultural understanding by connecting people from various backgrounds (Alfarhan, 2017) and increasing international conversations (Rido, 2020). Additionally, it is an essential academic support tool (Rofi'l & Nurhidayat, 2020), especially for English as a foreign language (EFL) learners, as it empowers them to move through the world with certainty. Therefore, mastering English offers these learners opportunities for global success in diverse contexts.

English writing proficiency is important for EFL learners, as it aligns strongly with academic achievement (Curtis, 2019; Naghdipour, 2021). This is particularly crucial for university students as learners with writing proficiency in English tend to generate higher-quality writing (Hz et al., 2023). This ability fosters increased academic performance, which aligns with Baker's (2019) observation regarding to an increasing dominance of English as the language of research. This implies that scholars from emerging countries are often encouraged to publish their work in English to gain recognition. It is evident by the fact that proficient EFL

learners are more likely to contribute articles to international publications. Beyond academia, effective writing skills are indispensable for many tasks necessary for achieving professional advancement (Petelin, 2022), such as creating persuasive business proposals comprehensive procedure manuals (Pratiwi & Waluyo, 2023). Additionally, strong writing skills encourage learners' participation in professional and academic discussions through forums and discussions with people worldwide.

Despite the undeniable importance of English writing, EFL learners confront numerous challenges to master this skill. Significant challenges arise due to the linguistic differences between their mother tongue and English (Mohammed, 2021), grammar (Ankawi, 2023; Bulqiyah et al., 2021), and vocabulary (Ceylan, 2019), resulting in ambiguity in learners' compositions. In addition, numerous EFL students struggle with organizational and structural issues (Toba et al., 2019). Generating well-structured writing involves both language competence and the ability to organize ideas clearly and cohesively (Bulqiyah et al., 2021). The absence of clarity leads to disconnected and ambiguous writing. Consequently, identifying the barriers helps educators to develop their teaching techniques and assist EFL learners in overcoming these writing obstacles.

In today's digital era, technology has emerged as an indispensable resource for various aspects of life (Raja & Nagasubramani, 2018), and proficiency in using technology is now acknowledged as an essential factor for academic achievement (Holm, 2024). This spans into the realm of language acquisition, where technology can improve the learning process (Bhat, 2023). Students can employ technology to access an abundance of resources and tools for developing their language through the wide range of language learning applications and programs. These technological resources make language acquisition opportunities more readily available and can empower learners to acquire language skills with greater self-sufficiency (Pratiwi & Waluyo, 2023).

To enhance learners' writing quality, educators have used digital writing tools, such as ProWritingAid, Paragraph Punch, Icourse, and Icourse+Pigai (Han et al., 2021; Linh & Ha, 2021). Building on existing studies on technology integration in writing classrooms, this study fills the gap in understanding the specific impact of ProWritingAid (grammar, spelling checks, word choice, clarity suggestions) and Paragraph Punch (paragraph structure and organization) on Thai EFL students majoring in English education at a government university in Thailand. It was anticipated that these digital tools would lead to positive perceptions during writing, which could potentially enhance their writing proficiency. Hence, the present study examines the following research questions:

- RQ1.** What are the students' perceptions towards writing?
- RQ2.** How does the integration of Paragraph Punch and ProWritingAid platform impact students' writing performance?
- RQ3.** What are the students' perceptions towards the integration of the Paragraph Punch and ProWritingAid platform in writing classes?

## LITERATURE REVIEW

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This literature review includes an overview of the various ways in which digital tools—in particular, Paragraph Punch and ProWritingAid have been used to enhance writing instruction. The areas of focus include the functionalities and effectiveness of these digital tools, including their features and characteristics. Despite the benefits of digital writing tools, students often encounter writing difficulties from cognitive, affective, and sociocultural dimensions. Understanding these challenges is crucial for effective writing instruction and student support.

### Digital Tools in Writing Classroom

In recent years, educators have been increasingly incorporating digital tools into the writing classroom to enhance students' learning outcomes (Marzuki et al., 2023; Wei et al., 2023; Xu et al., 2019; Zhang et al., 2022). They have become essential in modern writing practices, transforming the way individuals engage and write (Zhang, 2022). Digital writing tools are tools on a computer or other devices, often connected to the Internet, that enable students to create compositions and publish them to an authentic audience (McKee, 2016). They include any software, apps, technology, extensions, add-ons, or websites that are designed to assist writers, authors, students, and professionals in various aspects of the writing process (Dahlström, 2018). These tools

encompass an array of software applications and platforms designed to enhance various aspects of the writing process, ranging from drafting and editing to collaborative writing and publication. Exploring the influence of digital tools on writing skills and the composition process is an essential preliminary action in enhancing pedagogical practices and student learning outcomes in writing classrooms.

Paragraph Punch is one potential digital writing tool that students can use to enhance their writing skills independently from home. It was originated by Merit Evaluation Software in 2002. Alotabi and Alzu'bi (2022) emphasize its role in teaching students paragraph construction; for example, it assists the students in developing the mechanics of writing, including how to write a topic sentence, use proper paragraph structure, and connect ideas with linking words. During the writing process, students are given in-depth support in organizing their ideas, drafting, editing, rewriting, and publishing. Studies by Pujiawati (2018), Yunus et al. (2012), Mei-Lin (2009), Cherfaoui and Kaouli (2019), and Tran and Nguyen (2021) demonstrate its effectiveness in enhancing students' writing abilities, structuring their ideas, and fostering collaborative learning environments.

ProWritingAid is a digital tool that aids users in improving the quality of their writing through comprehensive feedback and analysis. It uses an automated writing evaluation (AWE) system, which integrates automatic written corrective feedback (AWCF) to enhance the detection of language errors (Ranalli, 2018; Shi & Aryadoust, 2023). AWE is powered by artificial intelligence (AI) that utilizes natural language processing (NLP) to assess and offer feedback on written texts (Wei et al., 2023). The use of AWE in language learning has been shown to enhance writing skills (Nunes et al., 2022), improve vocabulary usage (Ngo et al., 2022), boost writing fluency (Ajabshir & Ebadi, 2023), and increase writing accuracy (Ranalli et al., 2017; Zhang, 2020). Such feedback can ease teacher workload, improve learners' L2 development, and promote learner autonomy and motivation to write (Woodworth & Barkaoui, 2020). ProWritingAid offers comprehensive grammar and punctuation checking, providing users with immediate feedback on various writing issues. However, Nova and Lukmana (2018) note that although ProWritingAid helps with mechanics and grammar, it may not fully address writing complexities such as paragraph organization and coherence, which highlights the importance of combining digital tools with teacher feedback for a more holistic writing improvement approach.

With growing recognition of Paragraph Punch and ProWritingAid's positive impact, integrating these digital writing tools into the writing classroom is worth investigating, particularly in the context of Thai EFL students. It holds the potential to foster a more dynamic and interactive learning environment, empowering students to cultivate essential writing skills.

## Writing Difficulties

Writing encompasses a variety of challenges that extend beyond language aspects. Students frequently face challenges in their writing, which can be classified into cognitive, affective, and sociocultural dimensions. Each dimension introduces distinct obstacles that influence the writing process.

### Cognitive dimension

Cognitive factors play a significant role in the writing process and the way writing is taught. Cognitive difficulties in writing are frequently noticeable when planning, expressing ideas, and organizing thoughts, leading to struggles in thesis formation and arranging supporting details (Bakri, 2023). Revision and editing, essential aspects of writing, pose challenges such as identifying grammatical errors and restructuring sentences for clarity (AlMarwani, 2020).

Bulqiyah et al. (2021) explored obstacles in essay composition among undergraduate students. Results indicated linguistic competencies as the primary challenge, with many students lacking confidence in their writing abilities and understanding of the writing process. Semi-structured interviews highlighted difficulties in creating ideas, coherence, and vocabulary, along with grammar issues.

In addition, Ceylan (2019) and Toba et al. (2019) found students perceive language-related elements, such as grammar and vocabulary, as more challenging than organizing academic writing content. Toba et al. (2019) noted grammar as a major issue, with content errors including irrelevant or underdeveloped ideas and organizational flaws like a lack of transition signals and topic sentences.

These previous studies demonstrate that cognitive challenges, ranging from planning and organization to text generation and revision, pose significant hurdles for writers across various contexts. Understanding and addressing these cognitive difficulties are crucial for improving writing instruction and facilitating students' proficiency in written communication.

### ***Affective dimension***

Affective factors, such as emotions and motivation, play a significant role in influencing writing performance. Writing anxiety can obstruct creativity and expression, while low self-efficacy leads to reluctance in engaging with tasks (Deb, 2018). Focusing on the emotional dimension, Vacalares et al. (2023) examined affective factors affecting first-year education students' writing skills. The findings indicated that students were highly motivated and enthusiastic about daily learning. The findings also concluded that writing motivation is influenced by factors like achievement motivation and the implementation of technologies. Similarly, Kurniasih et al. (2022) investigated affective factors in online writing among 81 students enrolled in a paragraph writing course, categorized by proficiency levels. High and intermediate proficiency students exhibited high motivation, while attitudes, anxiety levels, and self-efficacy were moderate. Low-proficiency students showed intermediate affective characteristics. Motivation emerged as the sole significant predictor of writing ability across proficiency levels.

Furthermore, self-efficacy and motivation positively impact writing performance while anxiety may obstruct tasks, especially in second language writing contexts. Deb (2018) argued that self-efficacy is crucial for second language learning, particularly in grasping the complexities of second language writing. Anxiety can impede students' ability to generate written assignments, as highlighted by Soleimani et al. (2020), who examined affective factors influencing writing performance among 129 Iraqi Kurdistan English learners. Results showed that students with strong self-efficacy and motivation performed better in second language writing. Additionally, heightened anxiety levels in second language writing may have led to challenges or underperformance in writing tasks.

### ***Sociocultural dimension***

Sociocultural theory holds that students' capacity for learning is not solely reliant on their personal cognitive efforts, but their abilities are also shaped by the social and cultural contexts that surround them, both consciously and unconsciously. While contemporary perspectives on sociocultural theory are diverse, they commonly derive inspiration from Vygotsky's (1986) notion that higher-order cognitive processes are socially intertwined within specific cultural contexts. The sociocultural perspective adopted here views writing as a fundamentally social activity that is always mediated by and situated in the social context (Rish et al., 2015).

Taking a sociocultural perspective on second language writing, Mohammadzadeh et al. (2020) explored the impact of symmetrical versus asymmetrical scaffolding on intermediate EFL learners' writing accuracy, fluency, and complexity. The symmetrical scaffolding assumes learners acquire new knowledge through collaborative engagement and interaction while the asymmetrical scaffolding involves grouping learners with various zones of proximal development (ZPDs) for collaboration. Vygotsky (1978) proposed that the scaffolding emphasizes supporting novices with more capable peers in joint activities, enabling them to progress beyond their current level of competence. Mohammadzadeh et al.'s statistical tests revealed significant differences between the two scaffolding methods concerning writing accuracy and complexity, but no difference was found in writing fluency. Content analysis of interviews indicated positive attitudes toward collaborative writing, which was seen as enjoyable and beneficial by students. Rahimi and Norooziasam (2013) investigated the effects of sociocultural writing strategy instruction on Iranian EFL learners, revealing significant improvements in the experimental group's writing ability compared to the control group. Finally, Kang and Pyun (2013) employed qualitative methodologies, such as interviews, think-aloud protocols, and stimulated recalls to explore the writing strategies and mediated actions of two American learners of Korean from a sociocultural perspective. Their analysis revealed that the social context in which learners are situated can significantly influence the types of writing strategies and mediated tools they prefer and use. They further substantiated this finding by asserting that "a learner's written product is a result of a dynamic and complex interplay between sociocultural factors including a learner's cultural/historical experience, L2 proficiency,

motivation, learning goals, and the context or the community in which the learner is situated" (p. 64). In essence, these sociocultural perspectives shed light on how language is influenced by social and cultural contexts, enriching writing instruction by considering diverse experiences and backgrounds.

## Framework of Study

Figure 1 shows the conceptual framework of the study.

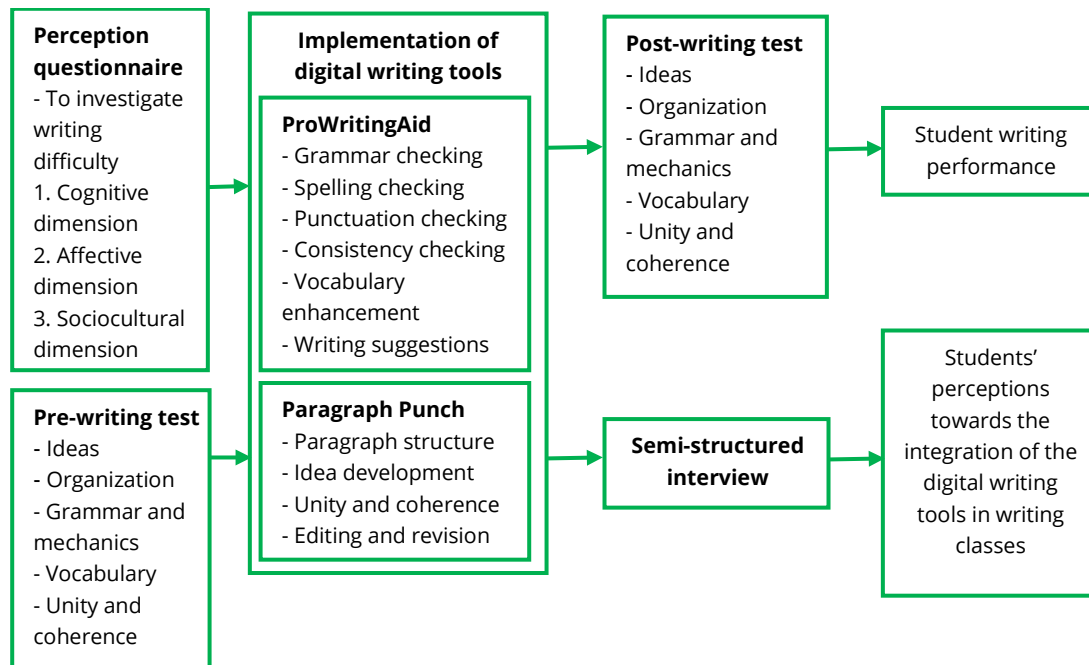


Figure 1. Conceptual framework of the study (Source: Authors)

## RESEARCH METHODOLOGY

This study combines quantitative and qualitative methods to explore the effectiveness of digital writing tools on Thai students' writing.

### Participants

Participants in the study consisted of 53 EFL undergraduate students enrolled in English education at the faculty of humanities and social sciences at a government university in Thailand. They were selected from a population of 257 undergraduate students in the same program. The sample group was chosen through purposive random sampling and comprised students who took a writing course during the second semester of the academic year 2023.

### Research Instruments

In this study, three research instruments were employed to gather comprehensive data. Firstly, a questionnaire in Thai version comprising 30 items with a 6-level Likert scale was designed to assess students' perceptions regarding writing problems, with a focus on cognitive, affective, and sociocultural aspects. It also included four open-ended questions involving writing obstacles, assistance sought, assistance preference, and obstacles to the assistance. The questionnaire aimed to provide insights into students' attitudes and understandings related to writing. Secondly, the same writing test was employed both before and after the writing intervention to evaluate students' writing skills development throughout the study. The test required students to write a descriptive paragraph (150-300 words) about "A person I admire the most" within an hour. They completed the written test on paper at both the beginning and end of the course. The test was evaluated based on five criteria: ideas, organization, grammar and mechanics, vocabulary, and unity and coherence. The

test underwent expert validation for content validity and was piloted with English education students to ensure reliability. Finally, semi-structured interviews were conducted. At the beginning of each interview, sociodemographic data were collected from the interviewees, including prior exposure to digital tools and access to technology. This information provides additional context for analyzing the effectiveness of digital writing tools on Thai EFL students' writing.

Following the collection of this data, a semi-structured interview protocol with nine main questions was used to gather more in-depth information about the students' perceptions of integrating digital writing tools into the writing classroom and to elicit unanticipated responses (Tunjera & Chigona, 2020). The researchers used numbers instead of names in order to ensure the confidentiality of the students. Notably, the identification numbers assigned to students in the interview session did not correspond to the anonymous responses collected through the open-ended questionnaire.

## Data Collection

### Phase 1

The researchers conducted a literature review on the digital writing tools and writing difficulties.

### Phase 2

Based on a literature review, the researchers developed the research instruments: a questionnaire, writing test, and semi-structured interview. These instruments were validated by three university lecturers. Then, a pilot test with 30 non-participating students was conducted to ensure instrument validation.

### Phase 3

After students were provided with information about the test, such as the purpose of the study, procedure, duration, and confidentiality, students completed a one-hour pre-writing test and a 40-minute questionnaire on writing perceptions on the first week before digital writing intervention. An eight-week intervention (3 hours per week) using ProWritingAid and Paragraph Punch was then implemented as part of their regular writing classroom. Then, a one-hour post-writing test was administered, followed by 2 purposive group interviews (5-7 students per group) in Thai one week later.

## Data Analysis

This research analyzed the quantitative data obtained from the pre- and post-writing tests and the students' writing perception questionnaires by finding means and standard deviations, and performing *t* tests. In addition, the researcher analyzed qualitative data obtained from open-ended questions in the perception questionnaire using content analysis. The interviews were recorded, transcribed, and translated from Thai into English. Content analysis was utilized to analyze transcripts for each student, aiming to understand their opinions on using digital writing tools in writing. Keywords from their responses were identified and categorized to comprehend their perceptions towards the integration of Paragraph Punch and ProWritingAid in the writing class.

## FINDINGS

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### Students' Perceptions of English Writing

Students completed a questionnaire titled "Writing Perceptions and Attitudes" to assess their cognitive, affective, and sociocultural dimensions of writing. The questionnaire included thirty 6-level Likert scale (strongly disagree–strongly agree) questions and four open-ended questions, exploring writing obstacles, assistance employed, and barriers preventing them from getting assistance. Descriptive statistics in **Table 1** provide an overview of the responses.

**Table 1** indicates a strong consensus among students that the primary writing obstacle was structuring thoughts for writing ( $M = 5.53$ ,  $SD = .50$ ), followed by writing topic sentences, supporting sentences, and concluding sentences ( $M = 5.49$ ,  $SD = .58$ ), and grammar ( $M = 5.40$ ,  $SD = .63$ ). Notably, students were unlikely to agree that they regularly seek feedback ( $M = 3.34$ ,  $SD = .78$ ) and enjoy providing feedback ( $M = 3.28$ ,  $SD = .66$ ),

**Table 1.** Students' perceptions of writing in English

No	Aspect	Items	<i>M</i>	<i>SD</i>	Rank	%
1	Cognitive	I do not know how to start writing.	4.64	.48	10	77.36
2		I have difficulty with brainstorming ideas for writing.	4.77	.64	7	79.56
3		I have difficulty with connecting thoughts and ideas cohesively in my writing.	5.34	.59	4	88.99
4		I have difficulty structuring my thoughts for writing.	5.53	.50	1	92.14
5		I have difficulty with revising and editing my writing.	4.43	.84	13	73.90
6		I have difficulty with maintaining a consistent and logical writing style in English.	4.32	.70	15	72.01
7		I have difficulty with writing topic sentences, supporting sentences, and concluding sentences.	5.49	.58	2	91.51
8		I have difficulty meeting deadlines and completing my English writing papers on time.	4.79	.84	6	79.87
9		I find grammar is a very challenging barrier when writing in English, such as article, tense, punctuation, and so on.	5.40	.63	3	89.94
10		I have difficulty with spelling.	3.83	.61	22	63.84
11		I have difficulty with the word order in my sentences and/or make poor word choices.	4.34	.71	14	72.33
12		I have difficulty with writing complete sentences.	3.77	.58	23	62.89
13		I do not know how to connect my sentences.	4.11	.80	17	68.55
14		Due to my limited vocabulary, I often use the wrong words to express my ideas.	3.96	.76	20	66.04
15		I can't write my work in English, so I write in my native language and use translation tools.	4.11	.78	18	68.55
16		I'm not proficient in generating well-crafted writing.	4.68	.67	9	77.99
17	Affective	I enjoy writing in English.	3.09	.88	30	51.57
18		I get nervous when I have to write in English.	5.09	.53	5	84.91
19		I find it comfortable when reviewing my papers in English.	3.42	.57	27	56.92
20		I prefer using digital applications in my writing class.	4.51	.87	12	75.16
21		I feel anxious because I'm unsure of what to write regarding the provided topic.	4.30	.46	16	71.70
22		I am motivated to enhance my English writing abilities.	4.08	.51	19	67.92
23		I am proud of the development of my writing skills in English.	3.68	.58	25	61.32
24	Socio-	I feel comfortable sharing my English writing with classmates.	4.53	1.01	11	75.47
25	cultural	I feel comfortable sharing my English writing with my English teachers.	4.72	.91	8	78.62
26		I enjoy providing feedback and comments on my classmates' papers.	3.28	.66	29	54.72
27		I regularly seek feedback from others to improve my English writing.	3.34	.78	28	55.66
28		When I struggle with writing, I consult my classmates for advice or assistance.	3.94	.41	21	65.72
29		I regularly seek support or reference for my writing difficulties.	3.72	.53	24	61.95
30		I appreciate the opportunities that arise from writing in English.	3.64	.88	26	60.69

which were rated as the third and second lowest overall, and they were least likely to agree that they enjoyed writing in English ( $M = 3.09$ ,  $SD = .88$ ). Open-ended responses uncovered three consistent themes: writing obstacles, assistance sought, and barriers to seeking help, which will be further explored below.

Students' open-ended comments revealed numerous writing difficulties during the pre-writing stage. For example, Student 17 stated,

"My hardest part is organizing ideas into a coherent outline, which causes me a lot of tension."

Similarly, another student indicated his confused thoughts, lack of a starting point, and struggling to structure his ideas cohesively (Student 30). Students 18, 35, and 44 also reported their anxiety, which caused less good quality work. Beyond organization, Student 39 voiced difficulties with 'developing outstanding topic sentences', 'linking supporting details' leading to disconnected paragraphs, and 'summarizing the points for the conclusion.' Moreover, several students questioned their proficiency in grammar (Students 5, 10, 16, 20, 27, 32, 41, 48, and 52). Similarly, Student 26 reported

"Grammar complexity, particularly those using clauses, troubles me. Applying appropriate conjunctions and minimizing fragments remain significant challenges. These concerns frequently undermine the clarity and consistency of my work."

Students sought assistance in various means. While Students 12 and 39 preferred discussing ideas with friends or requesting teachers' explanations to increase their understanding and promote assignments' coherence, Student 45 favored utilizing technology for writing guides and grammar checkers. Likewise,

another student reported using a writing website for proofreading, correcting his grammatical errors, and providing alternative word choices that boosted clarity (Student 21).

Students identified several barriers preventing them from getting assistance. Student 39 reported his friends' unavailability for consultation due to their unfinished assignments. One student acknowledged his own obstacle in understanding friends' suggestions due to a lack of paragraph organization comprehension, resulting in difficulty to produce good paragraphs (Student 51). Some revealed that technological unfamiliarity creates a barrier when attempting to acquire assistance from writing interventions (Student 13). Similarly, Student 46 expressed a fear of technology, preventing him from utilizing digital tools.

### Comparison of Students' Writing Performance Scores before and after Using Digital Writing Tools

To assess the extent to which the writing tools improved students' writing proficiency, pre- and post-writing test scores were compared using an assessment rubric with five criteria: *idea, organization, grammar and mechanics, vocabulary, and unity and coherence*. **Table 2** presents the lowest and highest scores, means, and standard deviations, alongside the *t*-test values and *p* values.

**Table 2.** Students' overall written scores before and after using digital writing tools

Score	Number of students	Total score	Lowest score	Highest score	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Before using digital tools	53	40	13.5	24.5	18.72	2.07		
After using digital tools	53	40	24.5	33	28.05	2.04	42.89	.000*

\*At a statistical significance level of .05

Pre- and post-test scores (*N* = 53) revealed significant improvement in writing proficiency after using digital writing tools. Post-test scores ranging from 24.5 to 33 surpassed pre-test scores ranging from 13.5 to 24.5. Notably, the mean post-test score (*M* = 28.05, *SD* = 2.04) was significantly higher (*t* = 42.89, *p* = .000) than the mean pre-test score (*M* = 18.72, *SD* = 2.07), indicating a significant writing improvement.

**Table 3** presents pre- and post-test scores based on a writing rubric, revealing significant improvements in writing proficiency after using digital interventions. Mean scores increased for all assessed areas: ideas (*M* = 3.62, *SD* = .87 to *M* = 5.55, *SD* = .70), organization (*M* = 3.24, *SD* = .70 to *M* = 5.44, *SD* = .68), grammar and mechanics (*M* = 3.96, *SD* = .65 to *M* = 6.16, *SD* = .61), vocabulary (*M* = 3.57, *SD* = .75 to *M* = 4.98, *SD* = .66), and unity and coherence (*M* = 4.32, *SD* = .92 to *M* = 5.91, *SD* = .72). Consistently low *p* values across all areas indicated statistically significant writing improvement.

**Table 3.** Students' English written scores before and after using digital tools classified by grading criteria

Criteria	Total score	Pre-test			Post-test				
		<i>M</i>	<i>SD</i>	Level	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	Level
1. Idea	8	3.62	.87	3	5.55	.70	25.36	.000*	3
2. Organization	8	3.24	.70	5	5.44	.68	26.36	.000*	4
3. Grammar and mechanics	8	3.96	.65	2	6.16	.61	24.23	.000*	1
4. Vocabulary	8	3.57	.75	4	4.98	.66	18.15	.000*	5
5. Unity and coherence	8	4.32	.92	1	5.91	.72	21.99	.000*	2
Overall	40	18.72	2.07	-	28.05	2.04	42.89	.000*	-

\*At a statistical significance level of .05

### Students' Perceptions towards Integration of Paragraph Punch and ProWritingAid in the Writing Class

Analysis of students' perspectives in the interviews revealed a positive impact of integrating Paragraph Punch and ProWritingAid into the paragraph writing classroom. The tools were seen as collaborative aids, each contributing distinct strengths to the writing process. While user-friendliness and timely feedback enhanced the learning experience, students also reported that the integration of these tools encouraged active participation and motivation in their writing process. The following are students' reflections towards the integration of Paragraph Punch and ProWritingAid in the writing class:



I've seen an improvement in my writing process with Paragraph Punch. The step-by-step approach ensures that I cover all aspects of paragraph construction. At first, I was hesitant to use the digital tool because I thought it would not help me come up with ideas for writing at the paragraph level. But the program showed me how to write effective topic sentences, supporting details, and concluding sentences, making my paragraphs more structured (Student 1: A female student with moderate exposure to digital tools and ownership of a smartphone).

Paragraph Punch program has been a great writing tool for me. It guides me through the entire writing process, starting from brainstorming ideas to constructing a well-organized paragraph. For example, when I struggled with generating ideas, the program prompted me with questions related to my chosen topic, helping me create well-organized paragraphs (Student 2: A male student with extensive experience in various educational software and ownership of a smartphone and a high-performance laptop).

The above excerpts demonstrate that both students perceived Paragraph Punch as a valuable tool that not only enhanced their overall writing process but also provided specific support in generating ideas, constructing effective topic sentences, and organizing paragraphs. The step-by-step and comprehensive nature of the program contributed to a more structured approach to writing.

When compared to other English skills, writing is the most complex activity for me because I have to think a lot about ideas, grammar, and how to write well. However, ProWritingAid helps me to polish my paragraphs. It identifies grammar mistakes, such as punctuation and spelling errors and offers suggestions for improvement. It catches errors that I might have missed, and the explanations provided help me understand why certain corrections are needed. It's like having a personal writing coach (Student 6: A female student with moderate prior exposure to digital tools, engaging in regular use for both academic and personal tasks, and owning a laptop).

Student 6 perceived ProWritingAid as a comprehensive tool that goes beyond simple error identification, providing explanations and suggestions for improvement. The student reported a positive impact on their writing process with ProWritingAid, emphasizing its role in refining and enhancing their paragraphs.

The integration of both tools has been beneficial to my overall writing performance. When I write by my own without writing tools, it takes me a lot of time for organizing ideas, checking grammar, and making sure that my writing is logical. Paragraph Punch helps me in the initial stages of generating ideas, and then I use ProWritingAid for editing grammar. It's a complementary process that ensures my paragraphs are not only well-structured but also polished in terms of grammar (Student 3: A female student with advanced proficiency in digital tools, frequently employing them for academic projects and personal tasks, and owning a laptop, smartphone, and tablet).

As seen in the above excerpt, the student recognized the distinctive roles of Paragraph Punch and ProWritingAid in different stages of the writing process. The integration was viewed as a complementary approach, addressing both the content and technical aspects of writing, ultimately contributing to well-structured and polished paragraphs.

I appreciate the user-friendly design of both tools. Although I'm not a technology expert, I find Paragraph Punch's simplicity great for quick brainstorming sessions. On the other hand, ProWritingAid, with its detailed reports, might seem complicated at first, but once you get used to it, the accessibility is excellent. I can use them on my own terms (Student 10: A female student with limited experience in digital tools and reliance on a shared family computer).

Student 10 valued the user-friendly nature of both tools. Paragraph Punch's simplicity was valued for quick and easy brainstorming while ProWritingAid's detailed reports were considered accessible and valuable once the student became accustomed to them.

The feedback from both Paragraph Punch and ProWritingAid acts as a preliminary check. They catch issues like grammar, punctuation, and spelling. However, what makes it even more effective is when I incorporate my teacher's feedback. Because there were sometimes undetected grammatical errors in the program, thus, the teacher also gave error correction or feedback to the students' grammatical errors which were undetected by ProWritingAid. It's like getting a two-tier review – first, the digital writing tools point out areas for improvement, and then the teacher provides specific guidance, especially the paragraph organization and coherence (Student 3).

Student 3 appreciated Paragraph Punch for guiding them through revisions while ProWritingAid catches overlooked errors. They saw feedback from both tools as a preliminary check, addressing structural and grammatical issues. They also emphasized the effectiveness of incorporating the teacher's feedback, especially in cases where the tools missed undetected grammatical errors. This approach is likened to a two-tier review process, involving digital tools and teacher guidance, pointing out areas for improvement and providing specific guidance on paragraph organization and coherence.

These tools have made a significant difference in my writing experience. Before using the tools, I had great difficulties to generate and relate my ideas. After using them, I feel more motivated knowing that I have Paragraph Punch to guide me in generating ideas and ProWritingAid to refine my writing. This support encourages me to participate actively in class, knowing that I have effective tools (Student 5: A female student with moderate prior exposure to digital tools, engaging in regular use for both academic and personal tasks, and owning of multiple devices including a laptop, smartphone, and tablet).

I've become more engaged in writing classes since using these tools. Paragraph Punch makes the brainstorming process smoother, and ProWritingAid ensures I catch any mistakes. Also, the teacher's interactions make me feel supported and motivated to improve my writing, which has increased my participation during classes (Student 7: A male student with moderate prior exposure to digital tools, using basic writing programs practically, such as MS Word and note-taking apps, and owning a laptop).

In the aspect of motivation and learning engagement, they felt more motivated and engaged in writing class, attributing it to the guidance provided by Paragraph Punch in generating ideas and the refining aspect of ProWritingAid. The combination of these tools encourages active class participation, creating a smoother brainstorming process and ensuring error detection. The overall support and motivation have led to an enhanced writing experience and increased involvement in writing classes.

## DISCUSSION

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### Research Question 1: What are the Students' Perceptions towards Writing?

The perception questionnaire was collected before using digital writing tools and questions were categorized into three domains: cognitive, affective, and sociocultural. Analysis of the questionnaire responses revealed that one item in the cognitive domain (Item 4: I have difficulty structuring my thoughts for writing) received a very strong level of average agreement (more than 5.5 out of 6), and several other cognitive items received high levels of agreement (4.50 or above). In the sociocultural dimension, the students agreed with two items while only one item in the affective domain received a high level of agreement.

It is evident that there was overwhelming agreement among students that a significant writing obstacle related to structuring thoughts for writing, as this item received the highest level of agreement on the questionnaire. This could also be seen in Students 17 and 30's open-ended responses in the questionnaire regarding the difficulty in organizing and structuring thoughts before starting to write. The results confirm the previous findings of Rasool et al. (2023), who discovered that students struggled with organizing their ideas. The study also reported that the challenge was caused by their stress and anxiety about criticism and negative evaluation. Potential reasons why students in the present study might struggle to organize their ideas for

writing could include unfamiliarity with paragraph organization, obstacles in brainstorming and idea generation, and lack of outlining skills.

In addition to lacking ideas on the topic, lacking the ability to construct well-structured writing was an additional barrier for Thai EFL students. This could be seen in students' high levels of agreement with Item 3 (I have difficulty with connecting thoughts and ideas cohesively in my writing) and Item 7 (I have difficulty with writing topic sentences, supporting sentences, and concluding sentences).

The results are consistent with the findings of previous investigations conducted by Toba et al. (2019), who identified EFL students' writing difficulties in areas of content and organization. The findings revealed that students generated irrelevant and restricted ideas, which were unrelated to the topic, and demonstrated difficulties with incorporating transition words. Moreover, they experienced challenges in constructing topic sentences, supporting ideas, and conclusions. This suggests that examining the skills and knowledge necessary for effective text organization could offer valuable insights for developing interventions and improving writing instruction for EFL learners.

Furthermore, students noted that their insufficient grammatical knowledge restricted their ability to convey their ideas in writing effectively. This observation is evident by the substantial proportion of students (approximately 89.94% in the questionnaire who agreed that grammar posed a major challenge (Item 9). They exhibited self-doubt associated with their grammatical mastery, demonstrating a thought that they might not be able to produce high-quality writing. Moreover, one student reported that the complexity of grammatical points affected the comprehensibility and consistency of his writing. The results align with the study of Bulqiyah et al. (2021), who observed that approximately half of the students experienced grammar difficulties and corroborate the findings by Toba et al. (2019), who reported that grammar is one of the primary problems for EFL learners in mastering composition. In the present study, a potential reason for students' deficiency could be a lack of confidence in their abilities due to low grades in their previous grammar and writing courses.

Moreover, it is clear from questionnaire items 26 and 27 that students expressed reluctance towards requesting and providing feedback from peers. One student (Student 51) reflected an appreciation of help from his friends; however, he could not understand the feedback and explanations effectively. The results contradict the findings of Alharbi and Alqefari (2022), who found that students were comfortable with peer feedback and valued the assistance and support they received from both peers and instructors. A possible explanation for the negative attitudes in the present study is that students may have received insufficient training in providing constructive feedback; consequently, they may need to be trained in effective feedback practices together with teacher's scaffolding.

Lastly, numerous students reported displeasure with writing in English, as shown by their negative responses to Item 17 (I enjoy writing in English) and their high levels of writing anxiety indicated by responses to Item 18 (I get nervous when I have to write in English). Notably, open-ended pre-intervention responses revealed student anxieties concerning producing low-quality writing, making grammatical mistakes, and lacking effective pre-writing strategies. Consistent with findings from Deb (2018) and Soleimani et al. (2020), anxiety hinders writing proficiency. Conversely, post-intervention interview data revealed positive changes in students' perceptions. This suggests that the writing obstacles prior to the intervention contributed to negative attitudes toward writing. The findings demonstrated improved writing abilities after using digital tools, suggesting that these tools may have contributed to more positive attitudes toward writing.

## **Research Question 2: How Does the Integration of Paragraph Punch and ProWritingAid Impact Students' Writing Performance?**

The integration of digital writing tools, Paragraph Punch and ProWritingAid, notably influenced student writing outcomes. The results revealed that the digital writing intervention led to statistically significant improvements in writing performance. Average scores showed a significant upward trend across all five criteria: ideas, organization, grammar and mechanics, vocabulary, and unity and coherence. According to the interview responses of Students 2, 5, and 10, the step-by-step process that these tools used helped them to develop their writing skills. These improvements align with the previous research of Pujiawati (2018) and Tran and Nguyen (2021), who emphasized that Paragraph Punch, through its scaffolding support and guided

approach, facilitated the development of fundamental skills in paragraph construction and organization among students.

Similarly, ProWritingAid appeared to function as a comprehensive tool for improving writing quality through grammar and punctuation checking. This can be seen in the interviews with Student 3 and Student 6, who confirmed that the tool helped polish their grammar. These results also align with the study of Nasution and Fatimah (2018), who found that ProWritingAid empowered students to identify and correct errors independently by analyzing text accuracy and providing detailed feedback. One key factor contributing to elevated writing proficiency is the ability of these digital writing tools to provide immediate and targeted feedback to students. This mechanism of feedback in real time is in accordance with previous research that highlighted the importance of timely and specific feedback in improving writing skills (Ferris, 2014; Shi & Aryadoust, 2023). By addressing errors in real time, students can actively participate in the revision process and internalize language conventions more effectively.

Furthermore, another factor that may have plausibly heightened students' writing performance might be the help provided by the teacher to students in identifying how specific digital tools addressed their writing errors. This interaction between teacher and students promoted students' comprehension of how tools work and enhanced their understanding of their writing deficiencies. This is consistent with the study of Ariyanto et al. (2021), who found that incorporating ProWritingAid and Paragraph Punch into writing facilitated greater engagement in teacher-student feedback, enabling teachers to concentrate more on content and organization within students' writing. Through this interactive approach, students can receive timely and individualized feedback, which fosters ongoing improvement of their writing skills (Handayani, 2020). It can be assumed that digital intervention in the present study enhanced cognitive interaction between teacher and students, ultimately leading to increased writing proficiency.

### **Research Question 3: What are the Students' Perceptions towards the Integration of Paragraph Punch and ProWritingAid Platform in the Writing Class?**

The integration of Paragraph Punch and ProWritingAid into the writing course received positive feedback from students. Despite their varying exposure to digital tools and differences in device ownership, the interview responses from Students 1, 2, and 5 collectively showed the usefulness of Paragraph Punch in structuring and organizing their writing. They mentioned that the step-by-step approach provided by Paragraph Punch assisted them in generating and organizing ideas, and constructing effective topic sentences, supporting sentences, and concluding sentences. This aligns with previous research that underscored the value of utilizing Paragraph Punch as a scaffolding tool in the writing process (Alotabi & Alzu'bi, 2022). By guiding students through various stages of writing, Paragraph Punch fosters a sense of confidence and competence among learners, which is crucial for writing development (Cherfaoui & Kaouli, 2019; Yuk et al., 2019).

Moreover, students perceived ProWritingAid as a comprehensive tool that not only identified grammatical errors but also provided explanations and suggested improvement. Although this tool functions as a valuable tool in addressing grammar, punctuation, and spelling, Student 3, who had advanced proficiency in digital tools and extensive use of various devices for multiple purposes, emphasized the need to have the teacher's additional feedback to provide comprehensive guidance, especially in such areas as content, unity, and coherence. This finding resonates with previous research that emphasizes the importance of combining digital writing tools with teacher feedback. For instance, Ariyanto et al. (2019), Nova and Lukmana (2018), and Ariyanto et al. (2021) found that while ProWritingAid could identify many errors related to mechanics and linguistic accuracy, there were sometimes undetected or misleading errors, and it had a limited ability to address the complexities of writing, such as content and coherence. In other words, it struggles to evaluate the semantic interpretation of a text or the content of a text. It is therefore advisable to consider incorporating teacher feedback alongside the use of ProWritingAid (Ariyanto et al., 2021; Wilson & Czik, 2016). Accordingly, many scholars (Li et al., 2015; Zhang & Hyland, 2018) have recommended a hybrid approach to the writing process: ProWritingAid performs an initial check, detecting general errors at the surface level, while teacher feedback provides comprehensive guidance such as paragraph organization, content, and coherence. This is consistent with Woodworth and Barkaoui (2020)'s viewpoint that the integration of the two feedback systems

– teacher feedback and digital tool feedback – could alleviate some of the challenges associated with relying solely on teacher feedback and promote a more autonomous learning process.

Furthermore, interviews with two students (Student 5 and Student 7) also revealed that the integration of Paragraph Punch and ProWritingAid fostered a collaborative learning environment wherein students felt supported and motivated to improve their writing skills. Based on prior exposure to digital tools, they could benefit significantly from utilizing the new software. The ability to work with a variety of devices (Student 5) and the practical use of writing programs (Student 7) showed flexibility and competency that might be used to establish a supportive and motivating learning environment. This collaborative aspect corresponds with findings from previous studies that emphasized the role of digital tools in promoting collaboration among students and facilitating peer feedback (Purcell et al., 2013). The collaborative nature of digital writing tools encourages active participation and engagement in writing classes, ultimately enhancing learning outcomes.

Although the integration of Paragraph Punch and ProWritingAid offers numerous benefits, they also bring challenges associated with the use of these tools in writing classes. One notable challenge is the excessive dependence on digital tools, which may reduce students' ability to thoroughly understand their mistakes. This is highlighted in the interviews with Students 2, 3, and 6 who mentioned that there was no need to focus too much on grammar because ProWritingAid functions as their grammar checker. Due to their familiarity with educational software, students 2 and 3 felt comfortable relying on tools such as ProWritingAid. Correspondingly, Student 6 found transitioning to utilizing these tools to be convenient; however, the student expressed a concern that relying on writing aids could hinder the ability to completely comprehend grammatical concepts. This suggests that excessive reliance on automated grammar and spelling checks from writing tools might discourage students from comprehending the underlying principles of language usage. This corresponds with Iskender (2023) and Marzuki et al. (2023), who expressed concern that students might prioritize quick fixes from digital tools over deeply understanding and learning from their mistakes, which would essentially negate the process of learning and development in writing. As a result, the students may become less proficient at identifying and correcting errors without the support of digital tools, which could cause lower writing proficiency in the long term.

Another potential drawback might be the technological barriers and accessibility issues among students. These can be seen from one student's interview (Student 10), which reported unfamiliarity with complicated software tools at the beginning. This suggests a potential lack of exposure in using complex software. Additionally, relying on a shared family computer might restrict access time and cause distractions, which would make it more difficult for her to learn and use new tools. These factors can contribute to the technological barrier mentioned by the student when encountering complex software. As noted by the student, the initial complexity of Paragraph Punch and ProWritingAid can be overwhelming due to the wide range of features and functions they offer. Hence, students who have restricted technological proficiency may find it difficult to operate and inefficiently utilize digital writing resources, which may lead to wider gaps in educational achievements.

In conclusion, students revealed various challenges in their writing, including idea generation, organizational structure, and grammar. Moreover, they expressed a reluctance toward both requesting and providing feedback and unfavorable attitudes towards writing. However, they demonstrated significant improvements for all writing criteria after using digital tools. This suggests that, when combined with teacher feedback for more thorough comprehension, these tools can play a valuable role in improving writing skills.

## LIMITATIONS AND SUGGESTIONS

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The present study was conducted with a group of students from one university in Thailand, which may restrict the research findings' generalizability. To gain a broader understanding of the effectiveness and challenges of digital writing tool integration, future research should gather data from students across different universities and educational backgrounds since they may have varying approaches to English language education and access to resources. Additionally, this study lacked long-term follow-up to assess the sustainability of these improvements. Therefore, longitudinal studies tracking writing progress over time would provide valuable insights into the lasting effectiveness of digital writing tool integration. Finally, there is a lack of a specific measure of students' cognitive skills after utilizing interventions with digital writing tools.

Although this study measures writing performance through pre- and post-tests, the researchers cannot ascertain whether the elevated writing quality resulted from the utilization of digital writing tools or from the students' own increased cognitive comprehension. Therefore, future research could incorporate methods, such as writing process logs or think-aloud protocols. These approaches would provide deeper insights into how students' cognitive skills evolve throughout the writing process.

## CONCLUSIONS

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This study examined the impact of technological tools on the writing performance of Thai EFL students. The results demonstrated that students exhibited improved writing skills and expressed positive perceptions towards the tools used for writing development. An indispensable element contributing to the efficacy of utilizing digital writing tools, such as ProWritingAid and Paragraph Punch, lies in the teacher's role. Teachers with a thorough understanding of the tools' features can effectively integrate them into their writing courses. This should not only foster student familiarity with the interface but should also improve their writing performance.

While the integration of these tools holds promise for enhancing writing instruction, educators must be aware of potential drawbacks and challenges associated with their use. By adopting a balanced approach that combines the strengths of digital tools with traditional pedagogical strategies, educators can create effective writing classrooms that support diverse learning needs and foster student engagement and proficiency in writing. The findings indicate that the implementation of digital tools could potentially assist Thai EFL students in their writing process and enhance their understanding of key elements of writing.

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