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Implementing the Use of Google Translate with Grammarly to Enhance Thai Upper Secondary School Students' English Writing Ability

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ABSTRACT

Correcting translation errors from Thai to English in machine translation outputs presents a significant challenge for upper secondary school students in Thailand. One way to address this challenge is to implement Google Translate with Grammarly, the AI post-editing tool, in Thai EFL writing classes. This study assesses the integration of Google Translate and Grammarly in EFL writing classes to improve writing skills conducted at a government school in Chiang Mai with 18 tenth-grade Arts-English students. The research employed the pretest-posttest design, collecting data through writing tests, questionnaires, and instructional periods. The findings indicated that students faced 11 translation errors, namely noun agreement and word choice, with punctuation being the least prevalent. After training with Google Translate and Grammarly concurrently, they showed significant improvements in writing performance, with higher post-test scores of 55.43% ($p < 0.05$). In addition, most participants reported positive attitudes toward the training due to its effectiveness in improving their writing skills

and confidence in English. Educators gained valuable insights into implementing a translanguaging approach in student interactions when applying the instructional periods. However, the study revealed limitations such as small sample sizes and technological challenges. Further research should explore the long-term effects of AI-driven instruction on enhancing English language skills across diverse educational settings.

Keywords: Google Translate, Grammarly, machine translation post-editing, English writing ability, EFL Thai upper secondary students

Introduction

Improving aspects of life stems from the need to overcome obstacles such as language barriers since the age of discovery. In today's interconnected world, translation plays a key role in bridging communication gaps between different linguistic and cultural contexts. Translation involves transferring text from a source language (SL) to a target language (TL) (Hatim, 2004). Relying on statistical models, bilingual dictionaries, and sets of grammar rules, machine translation began to take shape in the 1990s (Bowker, 2021). Many linguists and scientists developed computer software as a universal translator that promised to remove cross-language challenges and advance computational linguistics. The idea of machine translation for language pairs existed solely within the scope of imagination until the Google organization made it into reality and emerged as a leading provider of language translation services in a review of translation tech in healthcare (Rao et al., 2024), and among Chinese-to-English translation users (Sun et al., 2022). With recent AI-powered development, Google Translate has refined translation quality and correctness. EFL students widely embraced GT, which they found helpful in writing assignments, and its features helped accelerate the language translation process, leading to a richer vocabulary, fewer mistakes, better organization of ideas, and longer sentences (Moelyono et al., 2023).

Despite the increasing interest in Google Translate use as a platform for language translations, which offers many diverse benefits to language users, it has provoked a debate due to several drawbacks, including inaccurate translations, limitations on word count, and issues with translation features (Samad et al., 2023). GT's initial outputs were fairly inadequate, particularly at sentences and paragraph levels. The translated texts from Thai, the user's native language, into English, the target language, were assessed by common types of errors in syntax and semantics. Empirical evidence focused on its

poor translation quality, which might not fulfill the language standards required for academic writing (Tongpoon-Patanasorn & Griffith, 2020; Wongranu, 2017).

Through the application of Google Translate, one effective way to improve the quality of its output is Machine Translation Post-Editing (MT-PE), the process whereby humans or other tools refine the final outputs. EFL students post-edited the raw outputs from Google Translate by allowing subsequent modifications using another online tool based on their satisfaction and familiarity, referring to the term of recheck. (Vinall et al., 2023). The procedure in which Thai EFL university students post-edited their Google Translate outputs also occurred in Chompurach's (2021) study. The students' behaviors with Google Translate while writing English paragraphs and post-editing were analyzed using six patterns. In pattern 6, the students used more than one tool to post-edit after reviewing the raw outputs from Google Translate.

Combining Google Translate with other tools has been emphasized. Hartono et al. (2022) innovated the integration of Google Translate with the Grammarly Application (GTG-com App), which represented a developed translation solution for translating academic papers from Indonesian to English. Grammarly is an Automatic Writing Evaluation (AWE) program that has become widely used among English users to proofread their EFL work with better accuracy and a more natural flow.

Therefore, Google Translate and Grammarly should be consolidated in EFL writing teaching. A writing session tailored to the use of Google Translate with Grammarly as a Machine Translation Post-Editing tool can be efficient in helping to translate texts from Thai to English more accurately in EFL students' writing assignments, particularly for Thai upper-secondary students whose core grammar and academic-writing habits are still being developing. They rely more on teacher scaffolds with tasks aligned with the Thai Basic Education curriculum outcomes, not university-style paragraphs and essays in prior studies. The focus of this study was to answer the following research questions.

1.) What are the writing errors of Google Translate use from Thai to English for Thai Upper Secondary students?

2.) To what extent does the training in the use of Google Translate with Grammarly affect the Thai Upper Secondary students' EFL writing ability?

3.) What are students' opinions towards the training of Google Translate use with Grammarly to enhance their writing ability?

Literature Review

Google Translate in Educational Settings

The rapid advancement of translation software, especially Google Translate (GT), has significantly aided linguists and students. English major students with at least an intermediate proficiency baseline, allowing researchers to test aspects of language acquisition and making them representative of highly engaged EFL learners, used GT mainly for word meanings (Kate-Phan & Sripetpun, 2016). Challenges included simplifying texts, which addressed cultural differences and vocabulary issues due to GT's literal translations. Despite its value, many found GT unreliable for longer sentences, prompting discussions on post-editing to enhance quality. (Alhaisoni & Alhaysony, 2017; Bahri & Mahadi, 2016)

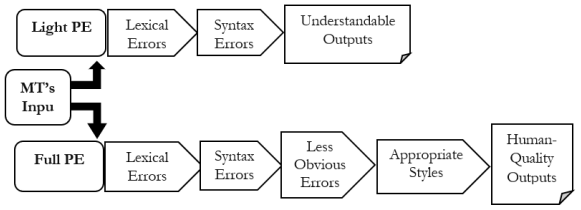
Post-Editing of Machine Translation Outputs

Level of Post-Editing

Machine translation, particularly from Google Translate, often lacked quality. Post-editing, by humans or tools, addressed this issue. Hu & Cadwell (2016) categorized two levels: Light Post-Editing, which corrects minor grammatical errors and makes outputs comprehensible, or able to convey meaning, and Full Post-Editing, which enhances translations to human quality by including all light PE steps and addressing subtle errors, style consistency, inappropriate content, and formatting problems, as shown in Figure 1. In the Thai EFL context, Chompurach (2021) stated that all students applied light post-editing at both sentence and paragraph levels in their outputs after using GT for their English writing. Therefore, Light PE should be at the primary level of Students' Post-Editing in this study.

Figure 1

Levels of Post-Editing (Chompurach, 2021; Hu & Cadwell, 2016)



EFL Students' Levels of PE and Patterns of GT Use with Other Tools

Vinall et al. (2023) explored L2 writers' use of Machine Translation and online tools. Participants engaged in light and full post-editing of Google Translate outputs, deciding to accept, reject, or take further action based on their satisfaction and familiarity with the outputs. For example, Student A changed Tour Eiffel output from Google Translate to Tour de Eiffel after rechecking English-French translation in Wikipedia Entry because the student questioned the accuracy of GT and turned to another tool for assistance. The term "Recheck" was displayed, verifying the initial translations using additional online tools, as participants sought to confirm nouns, verbs, phrases, and sentences due to doubts about GT's accuracy and their own writing skills.

Table 1

Examples of Recheck Behavior (Vinall et al., 2023)

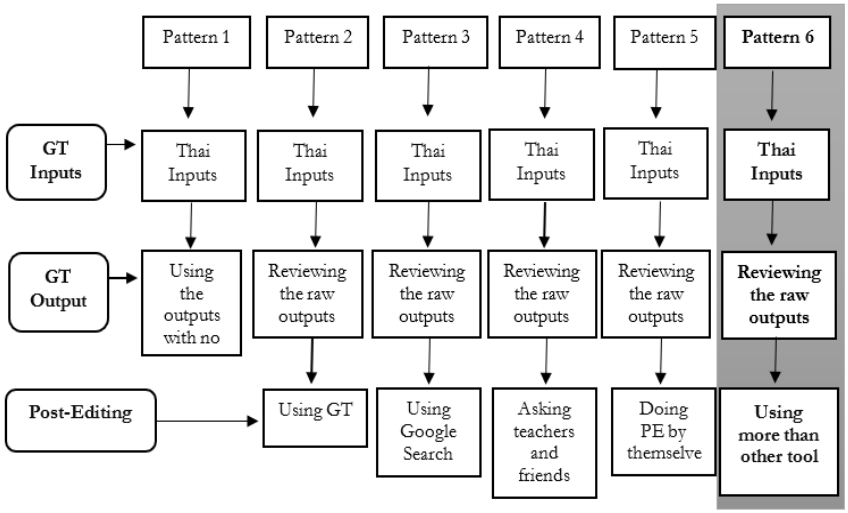
First Search			Second Search		
Tool	**Input**	**Output**	**Tool**	**Input**	**Output**
GT	Eiffel Tower	Tour Eiffel	Google Search Engine	Tour de Eiffel	Eiffel Tower Wikipedia entry
GT	Old	旧	Textbook	Does not find what the student is looking for	Resorts to GT Output

Some also questioned the reliability of Google Translate, prompting exploration of alternative online tools. Chung (2020) examined Korean university students who post-edited movie reviews initially translated by Google Translate and Papago, merging both outputs for a 30-minute editing task. The findings indicated that proficiency significantly affected students' post-editing patterns concerning error levels. For example, a high proficiency student detected "What position should Natalie take about leaving her side more and more?" as a Google Translate's sentence error in Papago and post-edited the output to "What could Natalie do in this desperate situation?" in a more natural and idiomatic way at a very high rate (92%), meanwhile intermediate and low groups rarely attempted complete sentence corrections, so even though their overall success rates are 90% and 77%, these mainly reflect word or phrase fixes, not sentences. In Thailand, the integration of Google Translate with post-editing was beneficial in linguistic distinctions between L1 and L2. Chompurach (2021) analyzed the compositional methods

employed by Thai EFL university students using Google Translate, revealing six distinct post-editing patterns, as illustrated in Figure 2. Notably, in Pattern 6, students actively refined Google Translate outputs using various additional tools. This approach reflected critical awareness of machine translation flaws and confidence in verifying accuracy with other resources. The thorough post-editing resulted in more natural and context-appropriate writing, producing outputs resembling human translations. As a result, this was directly connected to the study's aim, which systematized Pattern 6 into the classroom practice by pairing Google Translate for raw translation with Grammarly for structured post-editing and refinement.

Figure 2

Six Patterns of Thai EFL University Students' Post-Editing GT Outputs in English Writing (Chompurach, 2021)



The present study formed its framework by combining Google Translate with Grammarly. This enhanced students' practices in Pattern 6 and built an educational model tailored to meet the needs of Thai upper secondary learners. It also guided the formulation of research questions, the scheduling of instructional periods, and the evaluation of translation errors, all while being grounded in empirical evidence.

Grammarly in ELT Context

Grammarly, a popular automatic writing evaluation tool, is increasingly adopted in higher education to facilitate original content creation

(Arisandi & Sudarajat, 2023). It benefits EFL learners and educators by correcting punctuation, spelling, and grammar, as well as identifying issues with proper nouns, incomplete sentences, and verb forms (Benalileche, 2021). The free version includes essential features such as grammar checks for texts up to 500 words and automated typo detection (Dewi, 2023). Utilizing AI algorithms, Grammarly detects subject-predicate errors and misplaced punctuation, thereby enhancing writing clarity (Fitria et al., 2021). The premium version extends its capabilities with features like plagiarism detection and comprehensive writing assessments, offering users a sophisticated toolkit (Ummah & Bisriyah, 2022). The free edition of Grammarly provides fundamental proofreading capabilities, whereas the premium edition offers more advanced tools for academic writing. As this research only focused on the premium version, and Table 2 effectively demonstrates its enhanced features, the inclusion of this table was intended not only to highlight the functions most relevant to the training but also to justify why the premium version was chosen as the core reference for evaluating error detection and correction in students' writing.

Table 2

Grammarly's Premium Features (Ismawati et al., 2021)

Features	Sub-Features	Functions
Correctness	Spelling	To detect mistakes or incorrect translations
	Grammar	To improve sentence structure and grammar
	Punctuation	To add the appropriate punctuation or to delete any unnecessary punctuation.
Clarity	Wordy sentence	To prevent misunderstandings, simplify sentences
	Conciseness	To check to see if the sentences are short and do not utilize unnecessary or repetitive terms
	Passive voice	To check for improper passive voice usage
Engagement	Vocabulary	To suggest synonyms for words that better fit the sentence.
	Variety	To offer alternative word options that the readers will find simple to understand and relate to one another
Delivery	Tone	To set the writing's tone and deliver the right level of confidence, politeness, and formality in writing.
Style Guide	Writing Style	To maintain a consistent style

Translation Errors Produced by Google Translate

Translation errors occur due to misunderstandings or incorrect word usage, leading to various classifications in academic research. In the era of

new large language models (LLMs), ChatGPT has started changing the field of EFL writing instruction in Thailand. Apridayani et al. (2025) explored Thai English-major students' views on using ChatGPT for academic writing. The students rephrased and generated writing ideas in translation tasks. Unlike Google Translate, which provided direct text-to-text translations, ChatGPT enabled interactive refinement, allowing students to engage with the outputs. These findings indicated that research on translation errors should broaden to include more large language models (LLMs), presenting new opportunities and challenges for Thai EFL learners. Wongranu (2017) categorized Google Translate's translation errors into semantic and syntactic types. Most prior research has focused on older versions of Google Translate, with only Tongpoon-Panatasorn & Griffith (2020) assessing the newly updated system's quality in Thai-English translations. In their study, notable errors included capitalization (20.58%), punctuation (19.96%), and sentence fragmentation (16.27%), indicating issues with Thai syntax (e.g., missing subjects, incorrect verb tense, or awkward word order when translating from Thai to English.

Table 3

15 Types of Translation Errors Encountered in the 54 Academic Abstracts Translated from Thai to English by Google Translate (Tongpoon-Patanasorn & Griffith, 2020)

Error Types	Explanation	Number of instances	Percentage
Capitalization	Either missing or unsuitable capital letters	234	20.58
Punctuation	Missing or misplaced punctuation	227	19.96
Fragment	Incomplete phrases or missing clauses, subjects, verbs, or objects	185	16.27
Unclear Sentences	Too many unnecessary words or phrases that convey an incomprehensible meaning	91	8.00
Preposition	Missing or misuse of prepositions	67	5.89
Wrong Words/Word Choice	A variety of vocabulary used to express a clear meaning	63	5.54
Reference	Isolated word or phrase with no connection to previous or subsequent ideas	49	4.31

Error Types	Explanation	Number of instances	Percentage
Determiners (Articles)	Missing or misuse of definite or indefinite articles, etc	47	4.13
Repetition	Word or phrase repeated with no obvious purpose	42	3.69
Verb Forms	Misuse of or unsuitable verb tense, voice, phrase, clause, or case	27	2.37
Noun Agreement	Count or non-count nouns or plural agreements	24	2.11
Word Form	Incorrect part of speech	23	2.02
Sentence Structure	Missing, incorrect, or non-sequential sentence components	22	1.93
Pronouns	Incorrect pronoun; misuse of or missing relative pronoun	21	1.85
Conjunctions	Incorrect or missing conjunction	15	1.32
Total		**1137**	**100**

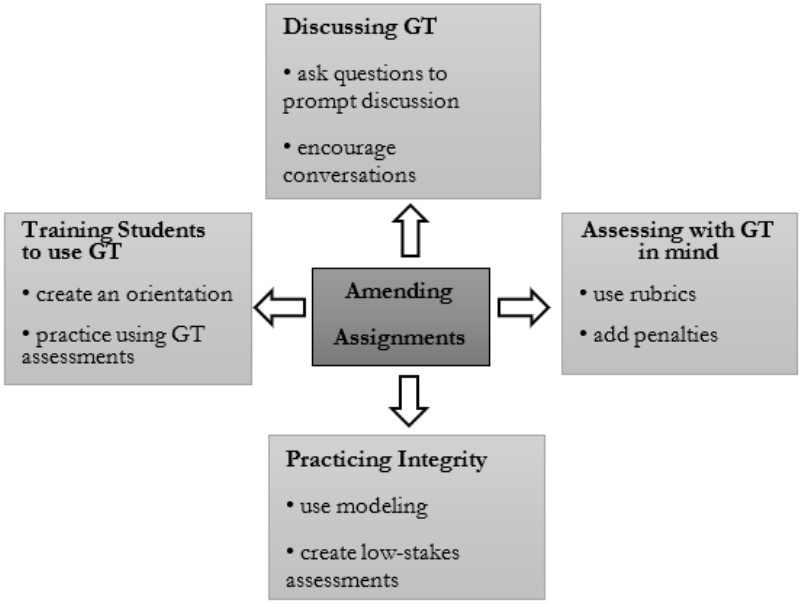
Table 3 is part of the conceptual framework of this study, which illustrates the categorization and analysis of translation errors. It serves as a systematic reference for classifying students' post-editing behaviors by connecting the error types to instructional interventions. This framework also aims to guide future teaching applications in Thai–English EFL writing contexts.

Training of Google Translate Use with Grammarly

Concerns about academic translations arise when authors depend on Google Translate (GT), often resulting in inaccurate outputs. (Samad et al., 2023). EFL students benefit from GT but require training on practical usage and post-editing (Chompurach, 2021). The training in this study was designed by incorporating Hartono et al.'s (2022) concept of combining Google Translate with Grammarly as a practical strategy to enhance translation quality. Furthermore, Knowles' (2022) ADAPT model in Figure 3 was considered as a pedagogical approach, which provided clear instructor guidance on the effective integration of Google Translate into EFL learning steps.

Figure 3

ADAPT Approach to GT use in the L2 Classroom (Knowles, 2022)



Drolet (2023) conducted the English course as a training exercise for Grammarly. As part of their final evaluation, the students had to write a problem-solving essay. Once the students had submitted the first draft of their papers, the instructor met with them one by one through Grammarly tutorials. The teacher gave feedback by color-coding, categorizing found error types in 4 different underlined colors in Grammarly: correctness in red underlined, clarity in blue underlined, engagement in Green underlined, and delivery in purple underlined, as shown in Figure 4. Drolet's study indicated that students viewed Grammarly as helpful for spelling, vocabulary, punctuation, and sentence structure, leading them to expect improved writing ability and grades. However, concerns about inaccuracies and overreliance emphasized the need for teacher guidance alongside AI feedback.

Figure 4

Color-Coded Key Document (Drolet, 2023)

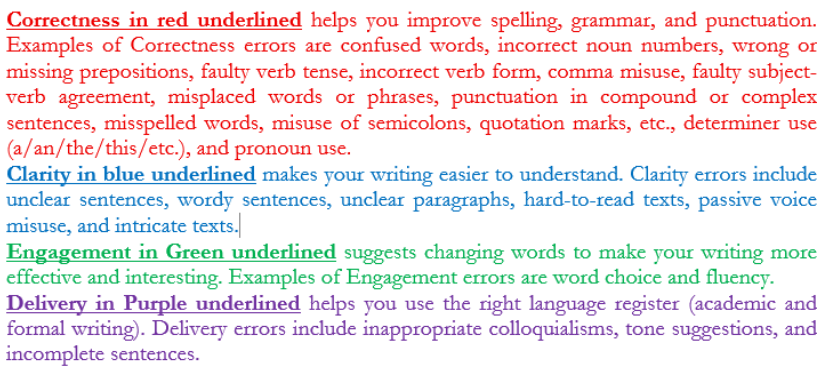


Figure 4 provides an overview of the main categories of translation errors in Grammarly, offering students a better insight into how errors are distributed for post-editing Google Translate's outputs. This colored-coded key document was utilized to create a research tool, specifically the online Thai-English translation worksheet used in the current study.

Students' Opinions towards the Training of Google Translate Use with Grammarly

Students' perceptions of the Google Translate and Grammarly training were analyzed using Knowles's (2022) ADAPT framework. Knowles discovered that 83% of students believed Google Translate's effectiveness depended on their L1 proficiency, with many students noting pronunciation and spelling as key benefits. Over half felt more confident using the tool but expressed concerns about overreliance. While Drolet (2023) reported on a survey of 25 of 29 students after Grammarly training, yielding largely positive feedback, only 44% advocated for increased AI tool usage. Students appreciated Grammarly's color-coded error system, which used red for correctness, blue for clarity, green for engagement, and purple for delivery. Similarly, this study indicated whether the provided training was helpful, highlighting its effectiveness in enhancing critical engagement with translations and improving writing quality.

Research on machine translation and post-editing in the EFL context has expanded. Yet, studies still lack examining Thai-to-English translation errors through a pedagogical framework. Consequently, this research utilized

Google Translate and Grammarly in Knowles's ADAPT framework in the training, as demonstrated by Hartono et al. (2022) and Knowles (2022), who emphasized the significance of guiding students to use translation tools. However, empirical evidence regarding upper-secondary Thai EFL learners who frequently face challenges with syntactic structures, verb tense accuracy, and vocabulary choices remains limited. To fill this gap, the study explored the effects of a targeted training intervention on the students' ability to identify and correct translation errors and their perceptions of AI-assisted support in writing development.

Methodology

Participants

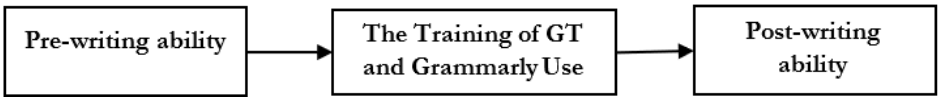
The target participants were 18 Thai Upper Secondary EFL students, aged 16-17, from a Northern government school. Those who consented to join were selected through purposive sampling, based on their 10th-grade English teacher's selection, which was used to recruit students, representing B1 CEFR levels. Teacher selection ensured participants could engage with the Google Translate-Grammarly training, produce writing samples that could be analyzed, and reflect an EFL classroom context, thus supporting the study's objectives to find out whether they experienced improvements in EFL writing assignments by using Google Translate.

Research Design

This study employed a one-group pretest-posttest design to assess the effectiveness of integrating Google Translate with Grammarly in enhancing Thai upper secondary students' English writing abilities. While the lack of a control group restricts the ability to attribute improvements to the intervention, this design was selected to allow students to engage without disrupting the instruction flow. To mitigate other threats, the same test was administered before and after the training. Teaching time was kept brief and consistent to minimize maturation effects, and feedback procedures were standardized to ensure fairness. These measures enhanced the confidence that the observed gains were related to the intervention, although future research with a comparison group would further strengthen causal inferences. The evaluation involved pre- and post-tests, comprising quantitative data from the online Thai-English translation worksheet with 8 Thai clippings, and the post-training questionnaire, structured around four instructional lesson plans focused on translation errors and tool usage as the intervention.

Figure 5

Conceptual Framework



Research Instruments

Online Thai-English Translation Worksheet with Google Translate's Translation Errors Correction

The test investigated Thai to English translation errors among B1 level EFL upper secondary students (Rangapthuk, 2014) using 8 article clippings from the Jamjuree Journal, which covered a one-hour class for pre- and post-tests. The B1 language features of the article clippings were analyzed using the online graded text editor (OGTE), a free tool for the English as a foreign language community that supports extensive reading. The researcher examined lexical levels, finding that sentence complexity, paragraph length, and vocabulary density could be identified with 80% coverage. According to Hu & Nation (2000), reading comprehension was challenging, with coverage below 80%. Regarding Google Translate's translation errors, 15 error types identified by Tongpoon-Patanasorn & Griffith (2020) were outdated. As Google Translate's AI in 2024 has significantly improved syntactic and semantic capabilities, only 10 translation errors were detected in the chosen 8 article clippings, code-colored and underlined in red, blue, and green, highlighting correctness, clarity, and engagement. Meanwhile, purple underlines were also detected, highlighting delivery and style guides that Grammarly can correct. Therefore, Table 4 categorizes all 11 Google Translate translation errors (Tongpoon-Patanasorn & Griffith, 2020) and highlights them in four distinct colors in Grammarly. (Drolet, 2023). Two independent raters coded each student's pre- and posttest outputs, and inter-rater reliability was calculated using Cohen's Kappa ($\varkappa = 0.86$), indicating a high level of agreement and supporting the consistency of the error categorization process.

Table 4

Main Table of Detected Translation Errors from Google Translate and Distinct Colors in Grammarly

Distinct colors in Grammarly	**Red**	**Blue**	**Green**	**Purple**
Detected Translation Errors from Google Translate	Punctuation Preposition Determiners (Article) Verb Form Noun Agreement Pronoun Conjunction	Wordy/Unclear Reference	Word Choice	Polite/Professional

The online Thai-English translation worksheet aimed to evaluate students' writing proficiency using Google Translate and Grammarly. The translation errors were categorized and corrected through multiple revisions. Initial IOC ratings of 0.30 fell below the 0.70 threshold. Experts' feedback led to instructional design and clarity enhancements, ultimately validated through a dedicated pilot group.

Instructional Periods in the Training of Google Translate with Grammarly

The researcher developed four instructional periods with standards and indicators in Basic Education Core Curriculum B.E. 2551 (A.D., 2008) in Thailand by forming terminal and enabling objectives based on Strand 2: F2.2: Language and Culture for Thai upper-secondary level students. By using Google Translate and Grammarly properly, the students must understand, create functional objects or methods, apply beneficial technologies, and engage in technological practices. As a result, the students were able to use Google Translate to render Thai sentences into English sentences and correctly post-edit those GT raw outputs with Grammarly as a proofreading tool for their EFL writing assignments. Each instructional period had Introduction, Teacher Presentation & Scaffolding, Students' Presentation, and Teacher's Feedback in four sequences, adapted from the ADAPT approach: Google Translate use by Knowles (2022), whereas the researcher included the core principles of 11 Google Translate translation errors (Tongpoon-Patanasorn & Griffith, 2020) and the meaning of four distinct

colors in Grammarly. (Drolet, 2023) as key lessons provided in PowerPoint slides. The teacher scaffolded the lessons by getting the students to translate races and match exercises in groups. Then, the students were tasked with writing assignments using GT and Grammarly, and the teacher's feedback was given, as shown in Table 5.

Table 5

Similarities between the teaching steps of ADAPT Approach and instructional periods with color-coded suggestions (Tongpoon-Patanasorn & Griffith, 2020, Knowles, 2022; Drolet, 2023)

The ADAPT Approach	The Instructional Periods
Amending Assignments: Encouraging students to improve their use of Google Translate	**Introduction** to Google Translate with Grammarly, initial translation tasks
Discussing Google Translate: Encouraging students to analyze translations critically	**Teacher Presentation & Scaffolding:** Learning about types of Google Translate's translation errors through mind-mapping and matching exercises, and Grammarly's proofreading tools
Assessing with Google Translate in Mind: Using rubrics and evaluation criteria	**Students' Presentation:** Identifying and classifying Google Translate's translation errors in Grammarly outputs when drafting writing assignments
Practicing Integrity, Teaching students about ethical use and avoiding over-reliance	**Teacher's feedback:** Revising and refining previous translations to demonstrate mastery

Each instructional period was a 50-minute class, so all sessions lasted 2 hours. The training began with an orientation and a review of Google Translate and Grammarly, focusing on their usage. The students were tasked with translating Thai sentences into English, refining their work with Grammarly. They explored 11 types of translation errors through the exercises and drafted a 250-word paragraph using both tools. Teacher's feedback fostered revisions that emphasized integrity in AI tools. The initial Item-Objective Congruence (IOC) score for the four sessions was 0.30, reflecting the incorporation of expert recommendations into the lesson plan. By following feedback from three experts, the researcher revised the objectives by refining the sentence structure, enhancing the instructional format to better guide students, and increasing the number of panels in the writing exercises for greater clarity. Consequently, the researcher improved the IOC score to 1.00.

Post-training Questionnaire

The questionnaire was adapted from Knowles's (2022) post-course questionnaire. The survey aimed to gather information about students' perceptions after participating in the training on using Google Translate with Grammarly and to gather more information about their willingness to take action once they completed the training. After confirming this validity, the experts assigned the IOC Score of 1.00.

Pilot Test and Students' Preparation

18 students, who were the target participants, also initially participated in a pilot test of the research instruments to assess questionnaire reliability using Cronbach's alpha. Acceptable reliability is indicated by values over 0.70 (Cronbach, 1951): the online Thai-English translation worksheet at 0.782, and the post-training questionnaire at 0.764.

Initially, the head English teacher only authorized 8 classes over two weeks, each lasting 50 minutes for data collection. 4 classes were for pre- and post-tests. The other 4 were booked for the instructional periods. The duration of time was not sufficient. It had to be extended to 12 classes within 4 weeks. During the pilot lesson, students faced significant challenges that caused distress. Therefore, pre-evaluating risks was important for the Institutional Review Board (IRB) to ensure participant safety. There were issues, including technical delays with online tools, which led to login difficulties and RAM failures, which needed technician intervention, extending the class duration. Minor emotional risks, such as mental fatigue and foreign language anxiety, were also evaluated. In addition, the students preferred bilingual instructions, which suggested a need for pedagogical translanguaging to enhance bilingualism. The use of the B1 measurement in this study was not misleading. The CEFR framework evaluates students' proficiency in English, rather than their preference for instructional language. Bilingual scaffolding was utilized as a pedagogical support to enhance comprehension and engagement, not as an indication of lower proficiency. This challenge arose with simultaneous language exposure, so it is necessary to distinguish the allocation of languages in the curriculum. While emphasizing prolonged exposure to the target language is vital, leveraging existing student knowledge remains crucial for effective bilingualism in educational settings.

Data Analysis

To evaluate the effectiveness of training GT use with Grammarly, data were obtained from the pre-test, the post-test, and the post-training questionnaire, and statistically analyzed using the mean scores (M), standard deviation (SD), and t-tests. Prior to conducting the t-tests, the assumption of normality was assessed. The Shapiro-Wilk test indicated that the difference scores were normally distributed, $p > .05$.

Results

Results of the Students' Translation Errors in the Pre- and Post-Writing Tests

To examine the writing errors of 18 Thai upper secondary students, the focus group identified 11 translation errors in the online student's Thai-English translation worksheet, which included 8 Thai clippings, that occurred during the pre- and post-writing ability phases. The test's scoring system utilized Grammarly's analysis of 11 types of translation errors in Google Translate, each marked by a unique color: red, blue, green, and purple. Students analyzed 8 clippings to identify these errors, tallying the total and noting the colors. Each correct identification earned 1 point, while incorrect ones received none. Recognizing that each error category contained a different number of scorable items, a normalization process was necessary before calculating the overall average. Therefore, the raw score for each category was first standardized by converting it into a percentage. This created a uniform scale, allowing for the subsequent calculation of a valid overall mean from these standardized scores. The results were rechecked by 2 inter-coders, as reported in Tables 6 and 7, and Figure 6.

Table 6

Students' Translation Errors in the Pre-Writing Test

Translation Errors	Pre-writing test	
	M	SD
Noun Agreement	6.89	0.32
Pronouns	6.83	0.70
Determiners (Article)	6.00	1.00
Polite/Professional	5.83	0.92
Prepositions	3.89	0.32
Reference	3.83	0.38

Translation Errors	Pre-writing test	
	M	SD
Word Choice	3.67	1.02
Wordy/Unclear	3.44	3.18
Verb Forms	3.44	1.14
Conjunctions	3.28	1.22
Punctuation	2.56	2.28

Table 6 shows students' translation errors in the pre-writing test. The study operationalized "detected translation errors" by categorizing students' outputs into 11 distinct error types. These categories were selected to represent the most frequent and significant challenges Thai upper-secondary students encounter. The categorization scheme was adapted from established EFL error taxonomies and was further refined through pilot coding of sample scripts. Two independent raters coded all pre-writing test data, and inter-rater reliability was assessed using Cohen's Kappa (κ = 0.86), which indicates a high level of agreement. Noun agreement errors averaged (M = 6.89, SD = 0.32), and pronoun usage errors (M = 6.83, SD = 0.70) were most prevalent. Errors in determiners (M = 6.00, SD = 1.00) and language formality (M = 5.83, SD = 0.92) underscored subsequent challenges in grammatical consistency. Lastly, errors in punctuation (M = 2.56, SD = 2.28) were identified as the least frequent.

Table 7

T-Tests between Pre- and Post-writing Tests and Translation Errors of Students in 8 Clippings Tested in the Online Student's Thai-English Translation Worksheet

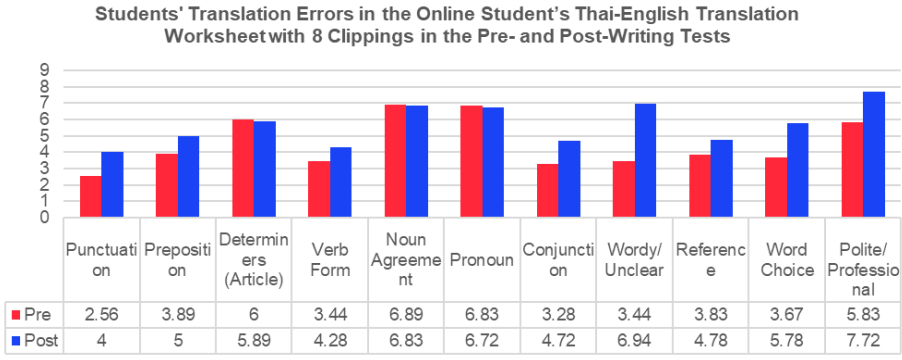
Translation Errors	Pre-writing test		Post-writing test		t	Sig. (2-tailed)
	M	SD	M	SD		
Punctuation	2.56	2.28	4.00	2.78	1.702	.098
Preposition	3.89	0.32	5.00	1.84	2.514	.022*
Determiners (Article)	6.00	1.00	5.89	1.18	.399	.0695
Verb Form	3.44	1.14	4.28	1.52	1.851	.073
Noun Agreement	6.89	0.32	6.83	0.92	.241	.812
Pronoun	6.83	0.70	6.72	0.66	.484	.631
Conjunction	3.28	1.22	4.72	1.63	2.994	.005*
Wordy/Unclear	3.44	3.18	6.94	2.71	3.550	.001*
Reference	3.83	0.38	4.78	1.43	2.694	.014
Word Choice	3.67	1.02	5.78	1.62	4.649	.000*
Polite/Professional	5.83	0.92	7.72	0.57	7.368	.000*

*Significant at level 0.05

According to Table 7, it is crucial to recognize that conducting eleven separate t-tests increases the risk of a Type I error. Therefore, while interpreting the findings of this study, this important limitation should be considered.

Figure 6

Distribution of Pre- and Post-Test Scores for each category (n=18)



	Punctuation	Preposition	Determiners (Article)	Verb Form	Noun Agreement	Pronoun	Conjunction	Wordy/ Unclear	Reference	Word Choice	Polite/ Professional
Pre	2.56	3.89	6	3.44	6.89	6.83	3.28	3.44	3.83	3.67	5.83
Post	4	5	5.89	4.28	6.83	6.72	4.72	6.94	4.78	5.78	7.72

Table 7 and Figure 6 demonstrate the effectiveness of the training, showing statistically significant improvements in student scores across several categories. The improvements in post-test scores can be attributed to the students' increased ability to detect errors. The training sessions with Google Translate and Grammarly likely provided students with practical skills to better identify stylistic and grammatical mistakes. This enhanced awareness allowed them to make more accurate choices in their writing, resulting in higher overall scores. The mean score for prepositions improved significantly from 3.89 (SD = 0.32) to 5.00 (SD = 1.84), $t(17) = 2.514$, $p = .022$. Similarly, scores for conjunctions rose from 3.28 (SD = 1.22) to 4.72 (SD = 1.63), $t(17) = 2.994$, $p = .005$, and word choice scores saw a significant increase from 3.67 (SD = 1.02) to 5.78 (SD = 1.62), $t(17) = 4.649$, $p < .001$. A significant improvement was also observed for polite/professional scores (from M = 5.83 to M = 7.72, $t(17) = 7.368$, $p < .001$) and wordy/unclear scores (from M = 3.44 to M = 6.94, $t(17) = 3.550$, $p < .005$). In contrast, the scores for punctuation, determiners, verb forms, noun agreement, pronouns, and reference exhibited no statistically significant improvement (all $p > .05$) following the intervention.

Results of Post-Training Questionnaire

The responses to the third research question were obtained from the post-training questionnaire, administered solely via closed-ended items after the Google Translate and Grammarly training session. This questionnaire evaluated students' perceptions of the training and ascertained whether it effectively enhanced their writing abilities in Tables 8 to 10.

Table 8

Perceptions of Google Translate Use with Grammarly Training

Items	M	SD	Scale
After completing the Google Translate with Grammarly, I felt better prepared to use Google Translate with Grammarly well.	4.28	0.75	Very High
The Google Translate with Grammarly assignment was beneficial to me.	4.39	0.60	Very High
The Google Translate with Grammarly assignment was busy work.	3.72	1.07	High
The Google Translate with Grammarly assignment made me feel more confident translating Thai-English during the training.	4.11	0.96	High
The Google Translate with Grammarly assignment made me more reluctant to translate Thai- English during the training.	4.11	1.07	High
Overall, The Google Translate with Grammarly assignment was beneficial in terms of learning writing English.	4.22	0.87	Very High
Average scores	**4.14**	**0.61**	**High**

Table 8 highlights generally high perceptions of using Google Translate with Grammarly. The assignment was rated as most beneficial, with a mean score of 4.39. The respondents felt better prepared and more confident in their translation skills, with mean scores of 4.28 and 4.11, respectively. The least favorable view was that the assignment was unnecessary, scoring 3.72. Overall, the positive perception of the integration resulted in a mean score of 4.14.

Table 9

Reasons that Students Use Google Translate with Grammarly after the Training

Items	Frequency	Percentage
I am not confident in my own work.	11	24.40
I ran out of time and must complete the assignment before the deadline.	8	17.80
I want to complete an English activity/assignment.	9	20.00
I want to check my understanding of the text.	10	22.20
I wanted to compare my written work to a translation.	7	15.60
Total	**45**	**100.00**

Table 9 reveals that, among 18 respondents who were able to choose only one choice in each questionnaire question, 11 (24.40%) cited a lack of confidence in their work as their primary reason for utilizing Google Translate with Grammarly post-training. This was followed by 10 respondents (22.20%) who needed to verify their understanding of a text, 9 (20.00%) who aimed to complete assignments, and others citing time constraints or comparison needs.

Table 10

Overall Perceptions of Google Translate Use with Grammarly

Items	M	SD	Scale
I feel Google Translate use with Grammarly is a beneficial tool for learning a language.	4.33	0.68	Very High
I feel Google Translate use with Grammarly will help me pass the class.	4.33	0.59	Very High
I would recommend this training of Google Translate use with Grammarly to other students.	4.11	0.83	High
Average scores	**4.26**	**0.62**	**Very High**

Table 10 indicates that, among 18 respondents, the students expressed positive perceptions regarding using Google Translate with Grammarly (M = 4.21, SD = 0.63). They strongly agreed that this integration enhanced their writing accuracy (M = 4.35, SD = 0.58) and increased their vocabulary awareness (M = 4.28, SD = 0.61). While perceptions of heightened confidence in editing skills were slightly lower, they remained favorable (M = 4.05, SD = 0.67).

Discussions

Research Question One: What are the writing errors of Google Translate use from Thai to English for Upper Secondary Thai students?

Common pre-writing errors often include 11 issues with noun agreement, pronouns, determiners, maintaining a polite or professional tone, using appropriate prepositions, reference, selecting word choices, wordy or unclear sentences, verb forms, and conjunctions. Generally, punctuation tends to have the fewest errors compared to these other areas, whereas, according to Tongpoon-Panatasorn & Griffith (2020), the translation errors produced by Google Translate had 15 types. It underscores notable advancements in Google Translate's AI capabilities between 2020 and 2024, particularly in syntax and semantics. The introduction of the Adaptive Translation feature in February 2024 significantly enhanced the user experience by utilizing a dataset of up to 30,000 expertly translated examples. This improvement leads to a quality enhancement of up to 23% (Google Cloud, 2024; Weldom & Modi, 2024), which reflects Google's dedication to advancing translation technology and offering users more accurate translations for improved communication across languages.

Research Question Two: To what extent does the training in the use of Google Translate with Grammarly affect upper-secondary Thai students' EFL writing ability?

Mastering English involves four skills: listening, speaking, reading, and writing, with writing often deemed the most challenging. Hartono et al. (2022) explored combining Google Translate and Grammarly to enhance writing skills, resulting in the development of Google Translate with Grammarly Combination (GTG-Com). This online application facilitates the translation of Indonesian scientific articles into polished English, leveraging Google Translate's capabilities with Grammarly's editing features. Consequently, the researcher incorporated the ADAPT approach of GT (Knowles, 2022) and Grammarly's color-coded suggestions (Drolet, 2023) in the training to improve Thai EFL students' writing proficiency efficiently.

Elevating insights, before and after the training, the target students were tasked to do pre-writing and post-writing tests in the online students' Thai-English translation worksheet to compare the students' pre-writing and post-writing data results. This shows the extent to which the training in the use of Google Translate with Grammarly affects the students. Regarding

proofreading 11 translation errors of Google Translate outputs in this study, the independent t-test assessed the relationship between students' writing test scores and translation errors across 8 clippings, including those from the online Thai-English translation worksheet. A significant difference was found between pre- and posttest scores, which indicates that the writing test scores differ in relation to translation errors at the 0.05 level ($t = 4.482$, $p < 0.000$). This suggests a great difference in translation errors between the pre-writing and post-writing tests for the students.

There was a significant reduction in translation errors related to Prepositions, Conjunctions, Wordy/Unclear phrases, Word Choice, and Politeness/Professionalism in the post-test when compared to the pre-test. However, no significant improvements were seen in punctuation, determiners, verb forms, noun agreement, References, or pronoun usage ($p > .05$). These areas are primarily syntactic and require explicit rule-based knowledge rather than surface-level pattern recognition. This suggests that either the instructional content for these six areas should be revised, or the duration of instruction should be extended to target the students more thoroughly. Also, students may not focus on fixing these minor grammar points, even with direct instruction. In light of these findings, the improvements should be considered substantial, yet selective, rather than remarkable. The intervention was most effective for error types responsive to automated feedback, highlighting that explicit instruction and focused practice remain essential for addressing persistent syntactic challenges. These improvements and unchanged outcomes also occurred in the GTG-Com app, which integrates Google Translate and Grammarly to enhance translation quality. Hartono (2024) reported that 60% of students transitioned from inaccurate to less accurate translations, while 40% moved from less accurate to accurate translations. Overall, their scores improved from 1.4 to 2.6, resulting in an average progress score of 2 per student when using Google Translate with Grammarly as an application. While these results align with the trends observed in the present study, they should not be viewed as direct evidence of causality. Instead, they support structured training, combining machine translation with proofreading tools, which can enhance translation accuracy. The consistency between Hartono (2024)'s findings and the results. This study reinforces the idea that using Google Translate with Grammarly can improve writing outcomes. However, further controlled studies are necessary to verify this effect with greater certainty.

Research Question Three: What are students' opinions towards the training of using Google Translate with Grammarly to enhance their writing ability?

The findings of this study build upon and expand previous research. Tongpoon-Patanasorn and Griffith (2020) highlighted 15 types of Google Translate's translation errors by Thai EFL students. To address this issue, the sixth post-editing pattern in using Google Translate among Thai EFL students, which involves utilizing multiple tools, resulted in the highest quality revisions (Chompurach, 2021). Combining Google Translate with Grammarly could enhance translation accuracy when students received comprehensive training (Hartono et al., 2022). Therefore, Knowles (2022) further emphasized the importance of structured frameworks, such as the ADAPT model, in the training to support technology integration. Based on the ADAPT approach, the instructional periods trained students to critically evaluate Google Translate outputs through engaging activities with Grammarly-assisted editing (Drolet, 2023). The post-training questionnaire assessed this training completion and identified the most and least beneficial sessions, which employed a five-point Likert scale to measure students' preparedness, confidence, and the training's effectiveness. As the students rated the efficacy of Google Translate with Grammarly at an impressive average of 4.14, this demonstrated remarkable enthusiasm and active participation. In the post-training, the students applied these tools with increased confidence, enhancing their understanding and accuracy in Thai-English translations, with the need to inform peers about the program. Therefore, training Google Translate with Grammarly in English as a Foreign Language (EFL) instruction empowers Thai upper secondary students. It can meaningfully improve writing accuracy and efficiency, especially in areas that most benefit from automated feedback. However, certain error types demonstrated no significant improvement, indicating that while the intervention provides meaningful gains, it does not represent a comprehensive solution. These findings highlight the importance of integrating AI-based tools with explicit instruction to tackle ongoing syntactic challenges. Furthermore, future research should investigate extended training or targeted modules for error categories that were not positively impacted.

Pedagogical Implications

Alternative Instructional Model of AI Translation with Proofreading Tools to Create Curricula, or Training to Enhance Digital Literacy

Digital literacy is the use of technology to create, evaluate, and manage information in EFL education. It includes navigating digital tools and analyzing language content to enhance learning. A key finding from the study suggests developing an instructional model that integrates AI translation and proofreading tools. This model could provide modern curricula and training

for EFL educators and students in Thailand. By emphasizing revision and language skills, the model can also be adapted for speaking, leveraging AI tools to transform EFL instruction effectively.

Enhancing Language Awareness: Pedagogical Translanguaging

In multilingual environments, pedagogical translanguaging is crucial for enhancing EFL learners' language awareness and critical thinking. In Thai upper secondary classrooms, it bridges the gap between Thai (L1) and English (L2) and boosts cognitive engagement and proficiency. A four-step cycle (Knowles, 2022) can be used in classrooms with 1-2 hour sessions. First, teachers introduce Google Translate and Grammarly with bilingual support to engage students. Next, students identify translation errors in Thai-to-English tasks to recognize error patterns. Then, learners collaborate on post-editing their drafts, fostering discussion and evaluation of AI output. Finally, teachers provide targeted feedback on persistent syntactic issues to reinforce rules and support long-term error reduction. A sample lesson outline in Table 11 demonstrates how teachers can combine translation tasks, color-coded error detection, and explicit mini-lessons on challenging grammar points within 50 minutes. This approach operationalizes pedagogical translanguaging by allowing students to leverage L1 knowledge to improve L2 accuracy while developing metalinguistic awareness.

Table 11

Sample Lesson Outline for 50-Minute Class with Translanguaging Focus

Stage	Time	Activity	Translanguaging Focus
1. Introduction	5 mins	Brief bilingual introduction of goals and today's focus (e.g., determiners).	Activates L1 knowledge and sets context.
2.1. Teacher Presentation: Google Translate + Grammarly	10 mins	Teacher demonstrates translating 3 Thai sentences into English, highlighting errors with Grammarly color codes.	Models L1 → L2 transfer and error noticing.
2.2. Scaffolding	15 mins	Students translate short Thai sentences, use Grammarly to find errors, and classify them by type (determinants, verb forms).	Promotes collaborative metalinguistic discussion in Thai & English.
3. Students' Presentation	15 mins	Students write a 100–150 word paragraph on a given	Encourages L1 strategic use and L2 production.

		topic, post-editing with Grammarly.	
4. Teacher's feedback	5 mins	Teacher highlights frequent issues, asks students to reflect on revisions.	Fosters awareness of cross-linguistic differences.

Table 11 presents the integration of translanguaging in a 50-minute lesson. The introduction leads students to activate their L1 grammar through bilingual explanations. Next, the teacher focuses on translanguaging by translating Thai sentences and using Grammarly's feedback to demonstrate the influence of L1 on L2 outputs. During the scaffolding stage, students participate in collaborative error discussions in both languages to enhance their metalinguistic understanding. In the application task, students brainstorm using their L1 before producing their final text in English, applying translanguaging to improve L2 accuracy. Finally, the reflection phase consolidates their awareness of cross-linguistic differences and promotes self-regulated learning.

Addressing the Over-Reliance on AI Translation in EFL Learning

Addressing the overreliance on machine translation requires a pedagogical balance of technology and active language engagement. EFL educators should guide their students to analyze and correct AI-generated translations, which fosters critical thinking and deeper language awareness. This study revealed no improvements in six syntactic areas: punctuation, determiners, verb forms, noun agreement, references, and pronouns. This underscores the importance for EFL educators and students not to rely solely on AI tools for grammar correction. Teachers should monitor students when they draft and correct the translation errors in writing classes. If there's insufficient main power or time in classes, integrating peer-editing and reflective tasks within AI-assisted exercises could promote autonomy, writing accuracy, and practical digital literacy. Teachers need to ensure that AI enhances, rather than replaces, language learning.

Limitations

Limited Generalizability due to Small Sample Sizes

The researcher intended to collect data from 30 English-major students; however, ultimately gathered results from only 18 Thai upper secondary students due to students' no-shows during class time. The use of B1 CEFR-level tests with only 18 Thai Upper Secondary students limits the generalizability of the findings. Although this group is suitable for assessing

proficiency at different levels, its narrow composition may not represent students across various proficiency levels. Furthermore, the findings of this study should be interpreted with caution, as the participants were from a public government school in Chiang Mai, Thailand, which is quite different from Bangkok, the country's capital. The results may not apply to institutions with better technological access, smaller class sizes, or more advanced teacher training. Differences in internet infrastructure, device availability, and students' exposure to AI-assisted translation could impact outcomes. Future research should include a larger, more varied participant group, with different CEFR levels from different educational contexts and diverse regions, better to understand AI tools' impact on EFL writing development.

Loss of Time due to Technology Integration in the Pilot Test

Many students encountered technical problems, including slow internet and difficulty navigating AI feedback, extending the duration. These issues raise concerns about classroom efficiency. Educators should implement structured preparation strategies to enhance the use of technology in EFL classrooms. Students can pre-install applications and have a stable internet connection before class. Introductory orientations with hands-on practice and video tutorials can facilitate students' familiarization with AI tools. Additionally, creating a troubleshooting protocol can minimize delays. On average, each session ran approximately 17 minutes longer than initially planned. The extension increased the instructional timeline from 8 to 12 sessions, improving students' completion of the lesson sequence. The extra time allowed for more guided practice and teacher feedback, enhancing engagement with error correction tasks. This emphasizes the need for sufficient class time and consideration of potential technical delays.

Statistical Limitations and Risk of Type I Error

The study indicated significant improvements in writing performance after an intervention. However, a methodological limitation exists due to the use of eleven paired-samples t-tests, which raises the risk of Type I errors from multiple comparisons. Future research should consider using a more robust statistical method, like MANOVA, to replicate these results.

Recommendations for Further Research

Longitudinal Studies on the Impact of AI-Assisted Writing in EFL Learning

A critical next step in research is to conduct longitudinal studies that examine the long-term effects of AI-assisted writing tools on EFL learners' language development. This study reported short-term writing improvements yet questioned the long-term impact of Google Translate and Grammarly on grammar and fluency. Future research should assess linguistic independence and dependency on AI and how these tools affect academic performance in standardized exams (e.g., IELTS, TOEFL).

Comparative Studies on AI-Assisted Learning across Different EFL Contexts

Thai upper secondary students are the focus group, but EFL learners globally utilize AI translation and grammar-checking tools in diverse ways. A comparative analysis across various linguistic backgrounds could reveal how language structures affect AI-generated errors and corrections and whether non-Thai L1 learners face similar obstacles. Understanding cultural perceptions of AI feedback will help educators craft tailored strategies for effectively integrating AI into EFL curricula.

Role of AI in Enhancing Listening and Speaking Skills in EFL Learning

Most research on AI-assisted learning focuses on reading and writing skills, but little is known about its impact on speaking and listening proficiency. Since EFL learners must develop well-rounded communication skills, further research should explore the effectiveness of AI speech recognition tools (e.g., Google Translate's voice feature) in developing speaking accuracy and pronunciation or the potential of AI chatbots and conversational AI (e.g., ChatGPT, Duolingo) to enhance real-time communication skills.

Ethical Considerations and Academic Integrity in AI-Assisted EFL Learning

This research gap illustrates the short-term benefits of using Google Translate with Grammarly for Thai EFL students. Future studies on AI-tool dependency and academic integrity should examine how teaching citation practices can reduce unintentional plagiarism in AI-assisted translation and rewrites. Researchers could investigate ways to ensure that post-edited work reflects students' original contributions and how IRB protocols can address authorship, students' data, and informed consent in AI language learning. This research would help institutions create guidelines for balancing

technology and ethics in EFL contexts. Additionally, researchers should examine AI's long-term effects and influence on various language skills, with ethical issues.

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