

EFFECTS OF THE DEEP DESIGN THINKING MODEL WITH CHATGPT ON WRITING SKILLS AND ANXIETY AMONG THAI EFL STUDENTS

Napaporn Sitthichirawatthanakul, Sudkanung Naruponjirakul

College of Education Sciences, Dhurakij Pundit University

Corresponding Author E-mail: 66130968@dpu.ac.th

Received March 18, 2026

Revised April 25, 2026

Accepted May 2, 2026

Abstract

This study employed a quasi-experimental one-group pretest–posttest design to examine the effects of the DEEP Design Thinking Model combined with ChatGPT on English writing skills and writing anxiety among Thai EFL students. The sample consisted of 38 Matthayomsuksa 5/4 students from Ayutthayanusorn School in the first semester of the 2025 academic year, selected through cluster sampling. The research instruments included lesson plans, an English writing skills test, and a writing anxiety questionnaire. Data were analyzed using mean, standard deviation, dependent samples t-test, and effect size (Cohen's d).

The results indicated that students' writing skills significantly improved after the intervention ($t = -14.97$, $p < 0.05$, $d = 1.34$). In addition, writing anxiety significantly decreased from a high to a moderate level ($t = 27.51$, $p < 0.05$, $d = 1.46$). However, the use of a one-group design may limit causal interpretation due to potential threats to internal validity, including history, maturation, and testing effects.

Keywords: DEEP Design thinking model, ChatGPT, Writing skills, Writing anxiety

Introduction

English is a core subject in Thailand's Basic Education Core Curriculum B.E. 2551, which aims to develop four language skills: listening, speaking, reading, and writing (Office of the Basic Education Commission, 2008). However, despite this emphasis, Thai learners continue to face difficulties in using English effectively for communication, particularly in productive skills. This issue remains a concern in the context of Thailand 4.0, which promotes a shift from grammar-based instruction toward practical communication and real-world language use.

Writing requires not only knowledge of grammar, vocabulary, and sentence structure, but also the ability to organize ideas systematically and express thoughts or feelings clearly (Thongmee & Meesri, 2019). Although English is one of the core subjects in the Basic Education Core Curriculum B.E. 2551, results from international assessments and previous studies indicate that Thai students' English proficiency remains below international standards. One major issue in English as a Foreign Language (EFL) instruction in Thailand is that most teaching methods tend to emphasize memorization and

translation rather than promoting practical language use or integrating technology into instruction. As a result, learners tend to lack motivation, experience limited development in writing skills, and often feel anxious about writing in English. In addition, writing activities are frequently limited to short-answer responses, which limits opportunities for students to develop more complex writing abilities (Phosa, 2020; Pongsukvajchakul, 2023).

Another important factor that affects writing skill development is English writing anxiety. This anxiety may arise from fear of making mistakes, fear of criticism, or previous negative learning experiences (Horwitz et al., 1986). Such anxiety causes learners to avoid writing tasks and reduces their opportunities to practice their writing skills, which directly affects their writing ability. Therefore, learning management that can reduce anxiety, encourage continuous practice, and provide constructive feedback is essential and should be further developed. The DEEP Design Thinking, proposed by Mary Cantwell, is a learner-centered approach that emphasizes analytical thinking, problem-solving, and experiential learning through four stages: Discover, Empathize, Experiment, and Produce. This approach allows learners to experiment, revise, and gradually improve their work without pressure to produce correct results from the beginning, thus helping to reduce fear of making mistakes and increase learners' confidence (Cantwell, 2012; Anandhavalli, 2017). At the same time, current educational policy in Thailand promotes the use of Artificial Intelligence (AI) to enhance learning efficiency and provide timely feedback (Office of the Basic Education Commission, 2025). ChatGPT can provide immediate feedback, assist in correcting errors, and give language suggestions effectively. Previous studies have shown that ChatGPT can support English writing development in terms of grammar, sentence structure, and content organization, and can also reduce learner anxiety (Mun, 2024; Nguyen, 2023; Alanazi et al., 2025). However, a review of the literature indicates that most studies tend to examine the effects of design thinking processes or AI tools independently. There is limited research that systematically integrates structured design thinking processes with AI-assisted feedback, particularly in the context of upper secondary EFL learners in Thailand. This gap is important because combining structured learning with real-time feedback may be more effective than using either approach alone. Therefore, this study proposes an integrated learning approach in which the DEEP Design Thinking process serves as the main learning structure, while ChatGPT functions as a tool for providing immediate feedback to support writing development and reduce anxiety.

Based on the reasons mentioned above, this study aims to investigate the effects of learning management using the DEEP Design Thinking Model combined with ChatGPT on English writing skills and writing anxiety among Matthayomsuksa 5 students. The study seeks to propose a learning management approach that not only improves writing skills but also reduces learners' anxiety. Furthermore, the findings are expected to provide practical guidelines for English teachers in integrating technology with learning processes in real classroom contexts. This approach may help reduce teachers' workload, improve assessment accuracy, and provide individualized feedback for learners.

Research Objectives

1. To compare the English writing skills of Matthayomsuksa 5 students before and after instruction using the DEEP Design Thinking Model combined with ChatGPT.
2. To examine changes in English writing anxiety of Matthayomsuksa 5 students after learning through the DEEP Design Thinking Model combined with ChatGPT.

Methodology

1. Research Design

This study employed a quasi-experimental one-group pretest–posttest design to examine the effects of learning management using the DEEP Design Thinking Model combined with ChatGPT on students' English writing skills and writing anxiety. However, this design can be influenced by internal validity threats including history, maturation, and testing effects. Although the study was conducted under consistent conditions, these factors cannot be completely controlled. Therefore, the findings should be considered carefully.

2. Scope of Research

2.1 Population and Sample

The population in this study consisted of Matthayomsuksa 5 students at Ayutthayanusorn School who were enrolled in the first semester of the academic year 2025. The population consisted of 10 classrooms with a total of 378 students. Each classroom consisted of students with mixed abilities.

The sample consisted of 38 students from Matthayomsuksa 5/4 at Ayutthayanusorn School who were enrolled in the first semester of the academic year 2025. The participants were selected using a cluster sampling method. All 10 classrooms were listed as clusters, and one classroom was randomly selected using a simple random method by lottery technique. The selected classroom was considered representative of the population due to similar curriculum, and mixed-ability student composition.

2.2 Content

The instructional content was based on the Foreign Languages Learning Area (English subject) of the Basic Education Core Curriculum B.E. 2551 and the school curriculum of Ayutthayanusorn School under the Secondary Educational Service Area Office including four types of writing: narrative writing, descriptive writing, expository writing, and persuasive writing.

2.3 Variables

Independent Variable: Learning management using the DEEP Design Thinking Model combined with ChatGPT
Dependent Variables: 1) English writing skills and 2) English writing anxiety

2.4 Duration

The study was conducted during the first semester of the academic year 2025 (June to August 2025), with a total duration of 18 hours. The duration was divided into three phases:

(1) Pre-instructional phase (1 hour): Students completed the English writing pretest and the writing anxiety questionnaire.

(2) Instructional phase (16 hours): The instruction was organized into four lesson plans (4 hours each), based on the DEEP Design Thinking Model combined with ChatGPT, including Discover, Empathize, Experiment, and Produce stages. In each lesson, students engaged in activities such as idea generation, drafting, receiving feedback from ChatGPT, revising their writing, and presenting their work.

(3) Post-instructional phase (1 hour): Students completed the English writing posttest and the writing anxiety questionnaire.

3. Research Instruments

3.1 The lesson plans were designed based on the DEEP Design Thinking Model combined with ChatGPT. There were four lesson plans, each with a duration of 4 hours, totaling 16 hours. The appropriateness of the lesson plans was evaluated by three experts. The results were found as follows:

Lesson Plan 1 had a mean score of 4.06, which was at a high level.

Lesson Plan 2 had a mean score of 4.53, which was at the highest level.

Lesson Plan 3 had a mean score of 4.45, which was at a high level.

Lesson Plan 4 had a mean score of 4.42, which was at a high level.

3.2 The English writing test consisted of two writing tasks designed to represent different types of writing aligned with the instructional content. Each task was scored using an analytic rubric covering five criteria: content, organization, vocabulary, language use, and mechanics, with a 4-point scale (1–4). Each task was scored out of 20 points, resulting in a total score of 40 points. Two trained raters independently scored all scripts using the same rubric. Prior to scoring, a calibration session was conducted to ensure shared understanding of the criteria. The final score for each student was calculated by averaging the two raters' scores. The use of two tasks was intended to increase content coverage and reduce task-specific bias. Content validity was confirmed by three experts (IOC = 1.00), and inter-rater reliability was high ($r = 0.98$).

Table 1 Assessment Criteria for English Writing Skills Used in the Study

Assessment Criteria	Rating Scale			
	4 (Very Good)	3 (Good)	2 (Fair)	1 (Needs Improvement)
Content	Shows very good knowledge. Presents complete content according to the topic with strong idea development.	Shows good knowledge. Presents most content consistent with the topic.	Shows moderate knowledge. Content is incomplete, missing 1–2 points.	Shows very limited knowledge. Content is incomplete, unclear, and not consistent with the topic.
Organization	Ideas are well-organized, logical, and continuous. Includes clear main idea, supporting details, and conclusion. Paragraphs are well connected.	Ideas are generally organized but may lack some continuity. Includes main idea, supporting details, and conclusion. Some paragraph connection.	Ideas lack continuity and clarity. Includes main parts but not complete. Limited paragraph connection.	Lacks organization. Missing main idea, supporting details, or conclusion. No paragraph connection. Meaning is unclear.
Vocabulary	Uses accurate and appropriate vocabulary. No errors.	Uses mostly correct vocabulary with few errors (2–3 points). Meaning is clear.	Uses limited vocabulary with some errors (4–6 points).	Uses very limited vocabulary with many errors (>6 points). Meaning is difficult to understand.
Language Use	Uses complex sentence structures correctly. Uses appropriate tenses with no errors.	Uses correct sentence structures and appropriate tenses with minor errors (2–3 points) that do not affect meaning.	Uses basic sentence structures and tenses but has several errors (4–6 points) that somewhat affect meaning.	Has many errors in sentence structures and tenses (more than 6 points), which affect overall meaning
Mechanics	Uses punctuation correctly with no errors. No spelling mistakes. Correct paragraphing	Uses punctuation with minor errors. Has 2–3 spelling mistakes but meaning is clear. Correct paragraphing	Has frequent punctuation errors. Has 4–5 spelling mistakes, making the text difficult to understand. Paragraphing is mostly correct.	Has many punctuation and spelling errors (more than 6 points), making the text unclear. Incorrect or no paragraphing

3.3 The English writing anxiety questionnaire was adapted from the Second Language Writing Anxiety Inventory (SLWAI) developed by Cheng (2004). It was a five-point Likert scale consisting of 22 items, divided into 3 components: somatic anxiety (8 items), cognitive

anxiety (7 items), and avoidance behavior (7 items). The content validity was verified by three experts using the Index of Item Objective Congruence (IOC), which had values between 0.67 and 1.00. The reliability was examined using Cronbach's Alpha Coefficient, and the reliability coefficient was 0.81, indicating acceptable reliability.

4. Data Collection Procedure

4.1 The research proposal and instruments were submitted for ethical approval to the Human Research Ethics Committee of Dhurakij Pundit University.

4.2 Permission to collect data was obtained from the school.

4.3 The researcher provided an orientation to the participants to explain the learning process using the DEEP Design Thinking Model combined with ChatGPT.

4.4 The participants completed the pretest on English writing skills and the English writing anxiety questionnaire before the instruction. After that, the results were examined and recorded.

4.5 The researcher conducted the instructional activities based on the lesson plans using the DEEP Design Thinking Model combined with ChatGPT.

4.6 After the instruction, the participants completed the posttest and the questionnaire. After that, the results were examined, and the scores were recorded.

4.7 The data were statistically analyzed and interpreted.

5. Data Analysis

Prior to analysis, the assumption of normality was tested using the Shapiro–Wilk test. The results indicated that the data were normally distributed ($p > .05$).

5.1 A dependent samples t-test was used to compare students' English writing scores before and after the intervention. Effect size was calculated using Cohen's d.

5.2 A dependent samples t-test was used to examine changes in students' English writing anxiety before and after the intervention. Effect size was calculated using Cohen's d.

Results

1. The English writing skills of Matthayomsuksa 5 students before and after learning through the DEEP Design Thinking Model combined with ChatGPT

Table 2 Comparison of English writing skills of Matthayomsuksa 5 students before and after learning through the DEEP Design Thinking Model combined with ChatGPT

English writing skills	n	Full score	M	S.D.	df	t	p	Effect size
Before learning	38	40	11.42	6.26	37	-14.97*	.00	1.34
After learning	38	40	22.24	7.59				

* $p < .05$

From Table 2, the mean score of students' English writing skills increased from 11.42 (S.D. = 6.26) before the intervention to 22.24 (S.D. = 7.59) after the intervention. A dependent

samples t-test indicated that this increase was statistically significant ($t = -14.97$, $p < .05$). The effect size was large ($d = 1.34$), indicating a substantial improvement in students' writing performance. These findings suggest that the DEEP Design Thinking Model combined with ChatGPT was associated with a meaningful improvement in English writing skills.

2. The English writing anxiety of Matthayomsuksa 5 students before and after learning through the DEEP Design Thinking Model combined with ChatGPT

Table 3 Comparison of English writing anxiety of Mathayomsuksa 5 students before and after learning through the DEEP Design Thinking Model combined with ChatGPT

English Writing Anxiety	n	M	S.D.	df	t	p	Effect size
Before Learning	38	3.78	0.84	37	27.51*	.00	1.46
After Learning	38	2.51	0.95				

* $p < .05$

From Table 3, the mean score of overall English writing anxiety decreased from 3.78 (S.D. = 0.84), indicating a high level, to 2.51 (S.D. = 0.95), indicating a moderate level after the intervention. The dependent samples t-test revealed that this decrease was statistically significant ($t = 27.51$, $p < .05$). The effect size was large ($d = 1.46$), suggesting a substantial reduction in students' writing anxiety. These results indicate that the DEEP Design Thinking Model combined with ChatGPT was associated with a significant decrease in English writing anxiety.

Table 4 Comparison of English writing anxiety by components

Components of English Writing Anxiety		n	M	S.D.	Level	Change
Somatic Anxiety	Before Learning	38	3.82	0.86	High	Decrease
	After Learning	38	2.46	0.97	Moderate	
Cognitive Anxiety	Before Learning	38	3.67	0.78	High	Decrease
	After Learning	38	2.60	0.89	Moderate	
Avoidance Behavior	Before Learning	38	3.84	0.87	High	Decrease
	After Learning	38	2.49	0.98	Moderate	

From Table 4, all components of English writing anxiety decreased from high to moderate levels after the intervention. Specifically, somatic anxiety decreased from 3.82 (S.D. = 0.86) to 2.46 (S.D. = 0.97), cognitive anxiety decreased from 3.67 (S.D. = 0.78) to 2.60 (S.D. = 0.89), and avoidance behavior decreased from 3.84 (S.D. = 0.87) to 2.49 (S.D. = 0.98). This consistent pattern across all components suggests that the intervention had a broad impact on different dimensions of writing anxiety.

Discussion

The findings of this study can be discussed in relation to the research objectives as follows:

1. The English writing skills after learning through the DEEP Design Thinking Model combined with ChatGPT were significantly higher than before learning at the 0.05 level of statistical significance, with a large effect size. This suggests that the intervention was associated with meaningful improvement in students' English writing skills. However, this improvement should be interpreted cautiously, as it may not be solely attributed to the intervention.

One possible explanation is that the DEEP Design Thinking Model provides a structured learning process that supports systematic development of writing skills. The learning activities were organized based on the four stages of the DEEP model, which may have facilitated step-by-step skill development. At the Discover stage, students explored writing structures and examples with support from ChatGPT. This aligns with the concept of design thinking that emphasizes understanding problems as a starting point (Cantwell, 2017) and with Rudolph et al. (2023), who suggested that ChatGPT can support independent learning. However, while previous studies often report improvement mainly in grammar and vocabulary, the present findings suggest broader development, including organization and idea generation. This may be due to the integration of structured stages within the DEEP process.

In the Empathize stage, students planned their writing based on audience awareness and purpose, which may have supported more meaningful communication. This is consistent with Wankong (2016), who emphasized the importance of audience and purpose in effective writing. In the Experiment stage, students engaged in drafting and revision with feedback from ChatGPT. This supports previous findings that feedback plays a key role in writing development (Huang et al., 2022; Daud et al., 2025). However, it is important to note that the effectiveness of feedback may depend on how learners interpret and apply it, which may be influenced by teacher guidance.

In the Produce stage, students refined their final work and reflected on their learning process. Reflection may have reinforced learning and contributed to improvement, as suggested by Faksang (2020) and Mun (2024). Nevertheless, repeated exposure to writing tasks may also have contributed to performance gains.

Previous studies have shown that AI-assisted feedback can improve students' writing performance, especially in grammar, structure, and idea development (Eragamreddy, 2024; Zhang, 2025;). However, some studies warn that over-reliance on AI may reduce learners' thinking and engagement, leading to more superficial learning (Abubakar et al., 2025; Vieriu & Petrea, 2025). This suggests that AI is most effective when it is used as a support tool rather than a replacement for learning.

In line with this perspective, the improvement in writing skills cannot be attributed solely to the intervention. Several alternative explanations should be considered. First, the testing effect may have influenced the results because students were already familiar with the writing tasks from the pretest. Second, maturation effects may have contributed since students could naturally develop writing skills over time. Third, teacher support during the lessons may also help improve their performance. In addition, the use of ChatGPT as a new tool may increase students' interest and motivation.

2. The English writing anxiety of Mathayomsuksa 5 students after learning through the DEEP Design Thinking Model combined with ChatGPT was significantly lower than before learning at the 0.05 level of statistical significance, with a large effect size. This indicates a meaningful reduction in students' writing anxiety. However, this result should be interpreted cautiously, as the reduction may not be solely attributed to the intervention. The decrease across all components—somatic anxiety, cognitive anxiety, and avoidance behavior—from high to moderate levels suggests a broad impact on learners' affective responses. One possible explanation is that the integration of ChatGPT provided a low-pressure environment for writing practice. Unlike traditional classroom settings, where feedback from teachers or peers may be associated with evaluation, AI-assisted feedback may be perceived as more neutral and less threatening. This aligns with Horwitz et al. (1986), who identified fear of negative evaluation as a major source of language anxiety.

In addition, the immediacy of feedback may have contributed to anxiety reduction. Students were able to revise their work promptly, which may have reduced overthinking and uncertainty during the writing process. This finding is consistent with previous studies indicating that AI-based feedback can support both writing development and emotional comfort (Hawanti & Zubaydullovna, 2023; Sangnarin et al., 2025). However, while prior research often emphasizes the benefits of AI feedback, some studies have reported mixed outcomes when learners rely passively on automated suggestions. Therefore, the positive results in this study may be influenced by the structured integration of the DEEP process, which encouraged active engagement and reflection rather than passive use of AI.

The large effect size may also be explained by the combined influence of cognitive and affective support within the learning process. The DEEP Design Thinking Model may have contributed to reduced anxiety by allowing iterative practice and minimizing pressure for immediate correctness, while ChatGPT provided continuous and accessible feedback. However, the role of teacher support should also be considered, as guidance during the learning process may have helped students interpret feedback effectively and maintain confidence.

Despite these positive findings, alternative explanations should be considered. The novelty effect of using ChatGPT may have increased students' motivation and engagement, particularly in the early stages of the intervention. In addition, repeated exposure to writing

tasks and increased familiarity with the assessment format may have contributed to reduced anxiety. Furthermore, the supportive classroom environment may have played an important role in shaping students' emotional responses.

Finally, the use of a one-group pretest–posttest design limits the ability to draw causal conclusions. The observed reduction in anxiety may be influenced by internal validity threats such as history, maturation, and testing effects. Therefore, future studies should employ a control group design to provide stronger evidence of the effectiveness of the intervention.

Body of Knowledge

The findings of this study led to the development of an integrated instructional framework, namely the DEEP–ChatGPT Writing Enhancement Model (DCW Model), which combines the DEEP Design Thinking Process with ChatGPT to improve English writing skills while reducing learners' anxiety.

The DEEP Design Thinking Model serves as the main learning structure by providing opportunities for hands-on practice, experimentation, and continuous improvement, leading to the development of process-based writing skills. Meanwhile, ChatGPT functions as a source of immediate and non-judgmental feedback that helps learners recognize errors, revise their writing, and improve their work continuously. Unlike the traditional use of these approaches separately, this framework emphasizes their structured integration through a process-oriented and feedback-driven mechanism.

In terms of learning outcomes, the integration can be explained through both cognitive and affective aspects. Cognitively, the DEEP model guides learners to develop writing systematically, while ChatGPT provides immediate feedback for step-by-step improvement. Affectively, ChatGPT reduces evaluation pressure and supports a low anxiety learning environment, which enhances learners' confidence.

The DCW Model can be applied in EFL classrooms that integrate technology into process-based learning. It may also be adapted for other skills, such as speaking and academic writing. The effectiveness of the DCW Model depends on three key conditions. First, teacher mediation is required to guide students in interpreting AI-generated feedback and preventing over-reliance on AI. Second, prompt guidance must be structured to ensure that students can generate meaningful and relevant feedback from ChatGPT. Third, reflective revision must be enforced, requiring students to actively evaluate and apply feedback rather than passively accepting it.

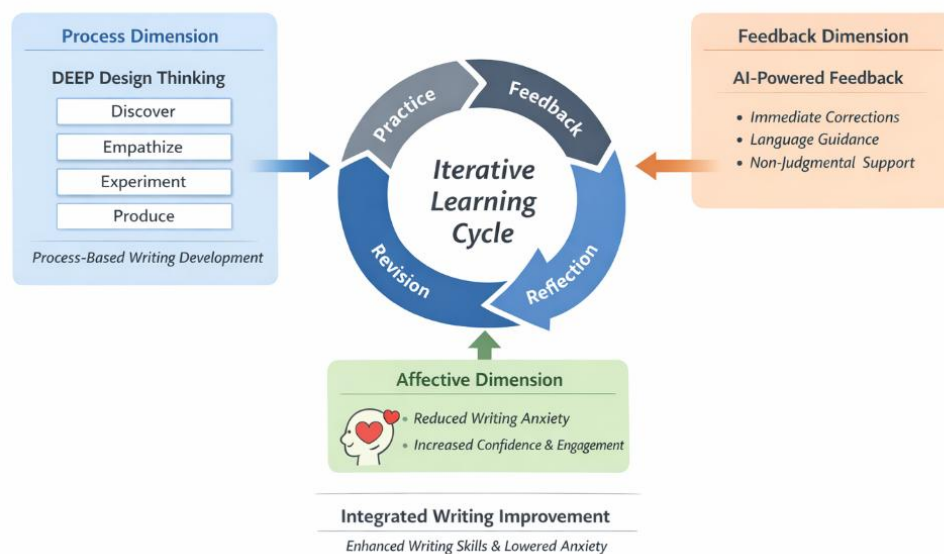


Figure 1 The DEEP–ChatGPT Writing Enhancement Model (DCW Model)

Conclusion and Recommendations

The findings indicate that learning management using the DEEP Design Thinking Model combined with ChatGPT is effective in improving English writing skills and reducing writing anxiety among Matthayomsuksa 5 students. Students' writing scores were significantly higher after the intervention, while their writing anxiety significantly decreased at the 0.05 level. These results suggest that integrating a process-based learning approach with artificial intelligence can support both skill development and affective outcomes. The DEEP model promotes structured, active learning and continuous improvement, while ChatGPT provides immediate, neutral feedback that facilitates revision and reduces anxiety. Therefore, this approach can be considered an effective instructional strategy for EFL writing contexts.

Based on the findings, the following recommendations are proposed:

1. Pedagogical implications

1.1 English teachers should integrate the DEEP Design Thinking Model with tools such as ChatGPT to promote analytical thinking, active learning, and authentic writing practice. ChatGPT can provide timely and individualized feedback, helping to reduce anxiety and enhance students' confidence.

1.2 Teachers should also encourage the appropriate and ethical use of AI while promoting students' digital literacy skills.

2. Suggestions for Future Research

2.1 Future studies should examine the effects of this approach on other English skills, such as speaking and reading, to compare outcomes across skill areas.

2.2 Comparative studies between AI-generated feedback and teacher or peer feedback should be conducted.

2.3 Additional variables, such as learning motivation, communication confidence, and higher-order thinking skills, should be explored to better understand the broader impact of this approach.

References

- Abubakar, S., Jeilani, A., & Yusuf, M. (2025). The Role of Over-Reliance on AI in the Negative Consequences of Student Learning: The Moderating Effects of Ethical Concerns and Institutional Policies. *Cogent Education*, 12(1), 1-15.
- Alanazi, S. M., Elmotri, B., Khamis, G. S., & Darem, A. A. (2025). Assessing the efficacy of ChatGPT's automated corrective feedback in enhancing students' writing proficiency. *International Journal of Advanced and Applied Sciences*, 12(2), 205-214.
- Anandhavalli, M. (2017). DEEP design thinking as a strategy for innovation management. *International Journal of Engineering Applied Sciences and Technology*, 2(8), 45-50.
- Cantwell, M. (2013). Why DEEPdt as a design thinking process? DEEP Design Thinking. Retrieved March 18, 2026, from <https://www.deepdesignthinking.com/deep-design-thinking/why-deepdt-as-a-design-thinking-process>
- Cantwell, M. (2017). 1 Pager #DEEPdt Dash. Retrieved March 18, 2026, from <https://www.deepdesignthinking.com/deep-design-thinking/1-pager-deepdt-dash>
- Cheng, Y. S. (2004). A measure of second language writing anxiety: Scale development and preliminary validation. *Journal of Second Language Writing*, 13(4), 313-335.
- Daud, A., Aulia, A. F., Muryanti, Harfal, Z., Nabilla, O., & Ali, H. S. (2025). Integrating artificial intelligence into English language teaching: A systematic review. *European Journal of Educational Research*, 14(2), 677-691.
- Eragamreddy, N. M. (2024). The Impact of AI in Creating Writing Skills in English Language Learners. *International Journal of Social Science Humanity & Management Research*, 3(12), 1573-1586.
- Faksang, C. (2020). A development of critical writing skills using feedback model approach for 11th grade high school students. *Journal of Education Silpakorn University*, 18(2), 110-122.
- Hawanti, S., & Zubayduloevna, K. M. (2023). AI chatbot-based learning: Alleviating students' anxiety in English writing classroom. *Bulletin of Social Informatics Theory and Application*, 7(2), 182-192.
- Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign language classroom anxiety. *The Modern Language Journal*, 70(2), 125-132.
- Huang, W., Hew, K. F., & Fryer, L. K. (2022). Chatbots for language learning: Are they really useful? A systematic review of chatbot-supported language learning. *Journal of Computer Assisted Learning*, 38(1), 237-257.
- Mun, C. Y. (2024). EFL learners' English writing feedback and their perception of using ChatGPT. *Journal of English Teaching through Movies and Media*, 25(2), 26-39.
- Nguyen, T. C. (2023). University teachers' perceptions of using ChatGPT in language teaching and assessment. *Proceedings of the AsiaCALL International Conference*, 4, 116-128.

- Office of the Basic Education Commission. (2008). Basic education core curriculum B.E. 2551 (A.D. 2008). Bangkok: Office of the Basic Education Commission, Ministry of Education.
- _____. (2025). Guidelines for using AI for teachers, students, schools, and parents in Thailand (B.E. 2568). Bangkok: Office of the Basic Education Commission, Ministry of Education.
- Phosa, S. (2020). Enhancing L2 learners' English writing proficiency through blended learning: A case study of Thai undergraduate students. *Journal of Humanities & Social Sciences*, 18(2), 193–212.
- Pongsukvajchakul, P. (2023). Analysis of Thai EFL university students' needs in learning English paragraph writing. *Journal of Management Sciences*, Kasetsart University, 2(2), 44–59.
- Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning and Teaching*, 6(1), 342–363.
- Sangnarin, T., Diteeyont, W., & Chaivisit, S. (2025). A study on the effects of integrating generative AI with reflective thinking to enhance advanced essay writing achievement of grade 8 students. *Journal of Educational Technology and Communications*, Faculty of Education Mahasarakham University, 8(26), 141–151.
- Thongmee, A., & Meesri, R. (2019). A comparative study of collaborative writing through small mixed-ability groups to reduce writing anxiety of grade 12 students. *An Online Journal of Education*, 47(2), 1–14.
- Wankong, A. (2016). English teaching in the 21st century. *Journal of Yanasangvorn Research Institute Mahamakut Buddhist University*, 7(2), 303–314.
- Vieriu, A. M., & Petrea, G. (2025). The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Education Sciences*, 15(3), 343–355.
- Zhang, K. (2025). Enhancing Critical Writing Through AI Feedback: A Randomized Control Study. *Behavioral Sciences*, 15(5), 600–613.