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Enhancing Chinese Writing Proficiency through E-Writing Integrated with the Production-Oriented Approach: A Study of Junior High School Students

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Abstract

With the increasing demand for learning Chinese, Thai students face numerous challenges arising from the structure and complexity of Chinese characters. This study aims to explore how to effectively combine E-writing applications with a Production-Oriented Approach (POA) to enhance students' Chinese writing skills using E-writing platforms with 50 Thai junior high school students. This research demonstrates that the combination of E-writing and POA teaching methods can enhance students' writing abilities and learning motivation, offering an effective solution for teaching Chinese writing and possessing significant theoretical and practical value.

◼ Introduction

As China's economy continues to grow rapidly, an increasing number of people worldwide are eager to learn the Chinese language. Over the last 40 years, learning Chinese has become more popular. Since the early 1980s, teaching methods have undergone continual improvement. More than 4,000 universities, over 80,000 primary and secondary schools, and training centers in more than 190 countries and regions worldwide will offer Chinese language courses by April 2024. More than 30 million people are currently learning the Chinese language. Eighty-five countries have incorporated Chinese into their national education systems (Zhao, 2021; Li, 2024). China's development in Thailand is comprehensive, systematic, and uniquely Chinese, affecting friendly exchanges between the two countries in economic, political, and cultural areas.

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In Thailand, Chinese language instruction is offered at the university, junior high, and primary school levels, and it is a part of the Thai national education system. Additionally, the number of students learning Chinese and the number of schools teaching Chinese have both increased significantly (Zhang & Wu, 2024). For a long time, many experts have believed that one of the most challenging aspects of learning Chinese is mastering the reading, writing, and memorization of characters. This is because Chinese characters differ significantly in form, pronunciation, and meaning. This has become a significant issue for individuals learning Chinese as a second language (Coss et al., 2024; Li, 2013; Lu,2024). However, the rapid growth of information technology is having a significant impact on how languages are taught worldwide. This encompasses the creation of Chinese teaching platforms and online models for teaching Chinese, such as the Global Chinese Learning Platform, Chinese Alliance, Tangfeng Chinese, Chinese Road, and Wodong Technology. It also includes the research and development of online learning platforms and digital teaching resources in the field of digital Chinese education, as well as the integration of information technology, artificial intelligence, and virtual reality (Wu, 2022; Wang, 2024). In the digital age, electronic device input is a crucial component of digital and smart teaching. It aligns better with the digital and smart transformation of Chinese teaching, enhancing the ways teachers can teach (Lu, 2024). Considering this, the American Chinese education community has proposed a new approach to teaching Chinese characters: E-writing. E-writing is what it sounds like: writing on a computer or phone. The primary methods encompass keyboard voice input (speech-to-text) and touchscreen writing (Chu, 2024; Lu, 2024). For people who are learning Chinese as a second language, E-writing can motivate them to learn by focusing on the practical use of language and helping them improve their Chinese expression skills. Teaching Chinese with E-writing is now a useful approach (Coss, 2024). It can help students learn Chinese more quickly, with less frustration, and with greater confidence and independence (Wang & Wang, 2024; Zhang, 2024). Additionally, Coss (2024) and others believe that E-writing is more suitable for today's students than traditional handwriting. From a practical point of view, writing Chinese characters electronically makes it easier and faster to communicate and interact with others, which meets students' needs for learning Chinese as a tool. Because it focuses on the usefulness of language, it can also motivate Chinese learners to learn by making output the primary goal of the lesson and helping them improve their ability to express themselves in Chinese. In modern Chinese language teaching, E-writing instruction has become a valuable approach to teaching (Coss, 2024; Chu, 2024).

So, this study focused on two core objectives: (1) enhancing students' motivation to learn Chinese writing using E-writing applications as an auxiliary tool and (2) improving students' Chinese writing ability using E-writing applications as an auxiliary tool.

■ Research Questions

1) How does the use of E-writing applications as a supplementary resource affect students' motivation in Chinese writing?
2) How does the use of E-writing applications as a supportive instrument improve students' proficiency in Chinese writing?

■ Significance and Purposes

1) To augment students' motivation in Chinese writing through the utilisation of E-writing applications as a supportive instrument.

2)   To enhance students' proficiency in Chinese writing through the utilisation of E-writing applications as a supportive instrument.

■ **Literature Reviews**

This study has analyzed and gathered information from numerous sources and research works that are relevant to the study topic. It can be summarized as follows:

Development of the international Chinese language

In the era of globalization, language teaching and economic development are inextricably linked. Over the past four decades, international Chinese language education has undergone rapid development, with the popularity and influence of the Chinese language continually increasing (Zhao, 2021). Today, Chinese language studies are flourishing both domestically and internationally, with teaching methods becoming increasingly diversified. Research on localization and regionalization in Chinese language teaching is also experiencing a surge in popularity. As a friendly neighbor of China, Thailand was the first country in the world to incorporate Chinese into its national education system, demonstrating distinctive characteristics and representativeness (Zhang & Wu, 2024).

In recent decades, Chinese language education in Thailand has undergone rapid development, permeating all stages of education, with diversified participation from primary and secondary schools, vocational schools, and non-governmental organizations becoming a trend (Li & Wu, 2022). With the advancement of the Belt and Road Initiative, Chinese language education has expanded from general teaching to professional fields, including industry and trade. The "Chinese + Vocational Skills" model promotes the integration of Chinese and Thai education (Kaewmanee et al., 2022; Chen, 2021). In the digital age, Chinese language teaching in Thailand has evolved into a diversified development model encompassing multiple fields, with abundant resources and comprehensive online course modules (Guo & Liao, 2025). In conclusion, as a typical country with a strong Chinese language education system, Thailand's Chinese language education is characterized by professionalism, depth, and systematization. Through joint efforts between the government and the public, various exchanges and cooperation are continually deepened and expanded.

Technology support for Chinese teaching and learning

Driven by the widespread adoption of internet devices and the globalization of education, the 21st-century learning environment has created conditions for new teaching explorations (Ramachandiran & Mahmud, 2019). International Chinese language teaching methods are constantly innovating, and digital education is developing rapidly (Gao et al, 2024; Xue, 2023).

Research shows that technology, as a learning medium, can support students' learning process and provide flexibility for both teachers and students. Compared to traditional methods, technology-driven language learning can provide personalized support (Guo, 2024; Yi & Chandra, 2023). In terms of teaching feedback, technological means are more advantageous. For example, Padlets can help students improve their learning motivation and reduce writing errors; AI tools,

such as ChatGPT, offer new possibilities for personalized learning and alter the traditional teacher-student interaction model. Technology can also enhance learners' intercultural communication skills (Li, 2024; Gao, 2023) and assist in Chinese writing instruction. For example, ChatGPT can help students improve their grammar, conversation, and writing abilities (Zhang, 2022). Teachers can utilize Padlets to provide feedback through various formats, including text and audio, thereby reducing students' learning anxiety (Rofiah et al., 2023).

With the support of various teaching technology tools, Chinese writing instruction has been optimized: Padlet supports students in expressing long paragraphs, facilitates timely feedback from teachers, and helps students improve their language expression skills (Rofiah et al., 2023; Ramachandiran, 2018); ChatGPT has significant advantages in brainstorming and other aspects, but students' dependence on it should be noted (Li, 2024); GoodNotes 5 is suitable for basic writing training, while Quizlet focuses on vocabulary and grammar accumulation, and both have limited effect on improving writing skills (Zhang, 2022; Guo, 2024).

Development of E-writing in teaching

The development and widespread application of digital technology have propelled E-writing to become one of the mainstream writing methods. E-writing refers to inputting Chinese characters through electronic devices, such as keyboards and touchscreens, and mainly includes three forms: keyboard input, touchscreen handwriting, and voice input (Chu, 2024). Experts in the field of international Chinese language education point out that E-writing instruction is an inevitable trend in the information age. It can provide students from non-Chinese cultural backgrounds with basic skills for learning Chinese characters (Lu, 2024; Shi & Ji, 2024), significantly reduce the burden on learners, and improve their abilities in Chinese character recognition, reading, electronic input, and differentiation (Zhang, 2024; Coss et al., 2024; Chu, 2024).

Therefore, the necessity of promoting the E-writing teaching model is reflected in four aspects: First, for learners, E-writing lowers the threshold for learning Chinese characters, alleviates their fear of difficulty, and prevents them from giving up on learning Chinese due to the difficulty of writing (Lu, 2024; Cui, 2024). Second, E-writing can improve learning efficiency, significantly increase learners' text output, accelerate learning speed, and develop Chinese skills (Feng & Wu, 2024). Third, E-writing is a mainstream communication method in the digital society, and cultivating this skill can meet learners' needs in life and work, helping them achieve their Chinese communication goals (Coss, 2024; Coss et al., 2024). Fourth, E-writing has the characteristics of immediacy, convenience, and accuracy. Lower-grade students can easily learn Chinese characters with the help of pinyin input, which stimulates their interest in learning. Higher-grade students can freely express their opinions through pinyin input, thereby enhancing their sense of accomplishment in learning (Zhai, 2024). Additionally, teachers can utilize E-writing software to provide personalized and targeted writing tutoring. In conclusion, e-writing instruction is suitable for Chinese learners of various levels and offers a new approach to traditional Chinese character instruction.
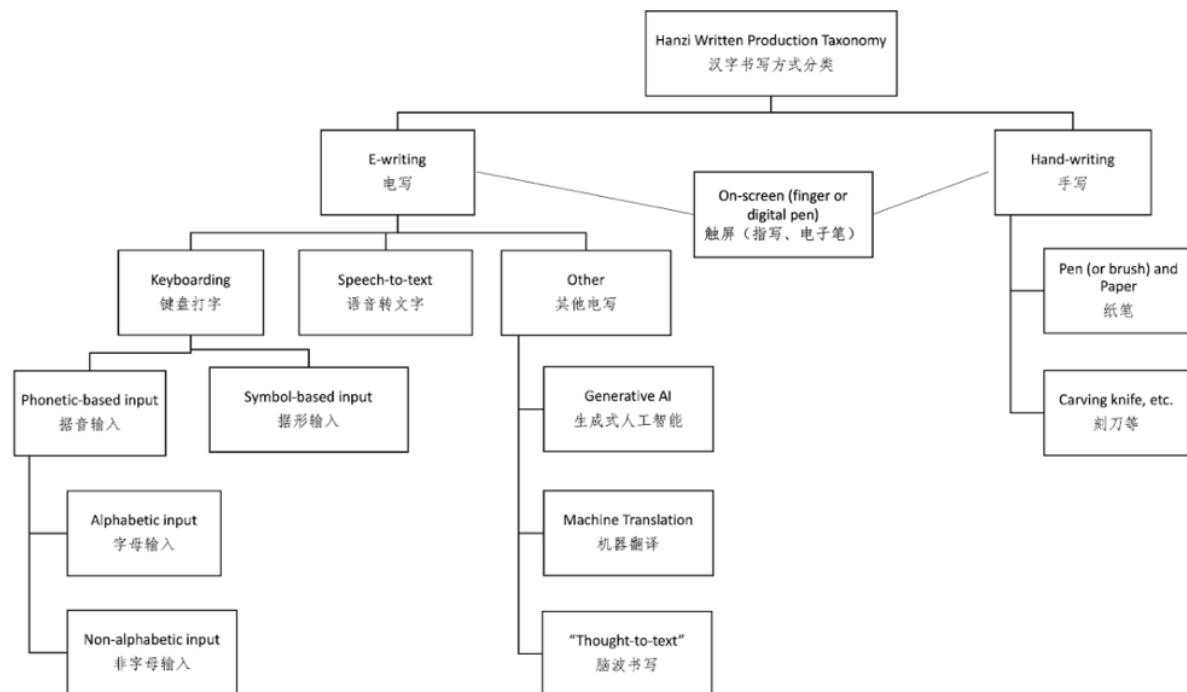
Figure *1.* A Taxonomy of L2 Chinese Written Production (Coss et al., 2024)

Chinese E-writing teaching guided by the POA teaching method

The Production-Oriented Approach (POA) teaching method (Wen, 2018) proposes an "output-driven-input-facilitated" hypothesis, with output as the primary outcome, and presents four teaching hypotheses: output-driven, input-facilitated, selective learning, and evaluative learning, as illustrated in Figure 2.

In teaching Chinese as a second language, existing research has shown that the POA method can significantly improve classroom teaching effectiveness. This approach, based on precise task design, helps learners solidify core knowledge points, improve language expression skills, and fully mobilize their learning initiative and enthusiasm. Ultimately, learners exhibit significant advantages in dimensions such as classroom participation, academic performance, and the quality of language output (Zhu & Bai, 2019; Yuan, 2023; Hu, 2022). Specifically in writing instruction, instructional design based on the POA method can guide learners to use vocabulary more appropriately and accurately, significantly improving writing skills while enhancing their attention and engagement with classroom content (Zhao, 2023).

However, despite the significant advantages of the POA method, in traditional classroom environments, class time is limited, and interactive feedback is not timely enough because teaching often requires a significant amount of time (Chen, 2019). Furthermore, while there is considerable research on POA in traditional pen-and-paper writing, research on writing instruction in the digital age is relatively limited (Fan, 2021). POA emphasizes output-driven learning, and e-writing platforms provide the technological infrastructure for this principle through features such as instant feedback and collaborative editing (Rofiah et al., 2023). Therefore, deeply integrating e-writing instruction with the POA teaching method, guided by POA's "learning-application integration" philosophy and supported by the technological advantages of e-writing, allows for two key approaches: firstly, POA clarifies the teaching objectives and tasks of e-writing, avoiding the blind application of technology; secondly, the

collaborative and interactive functions of e-writing promote the implementation of the three stages of POA "input-facilitation-output." Ultimately, by leveraging POA's advantage in improving the quality of language output, it can further stimulate students' interest in writing and their enthusiasm for learning Chinese.
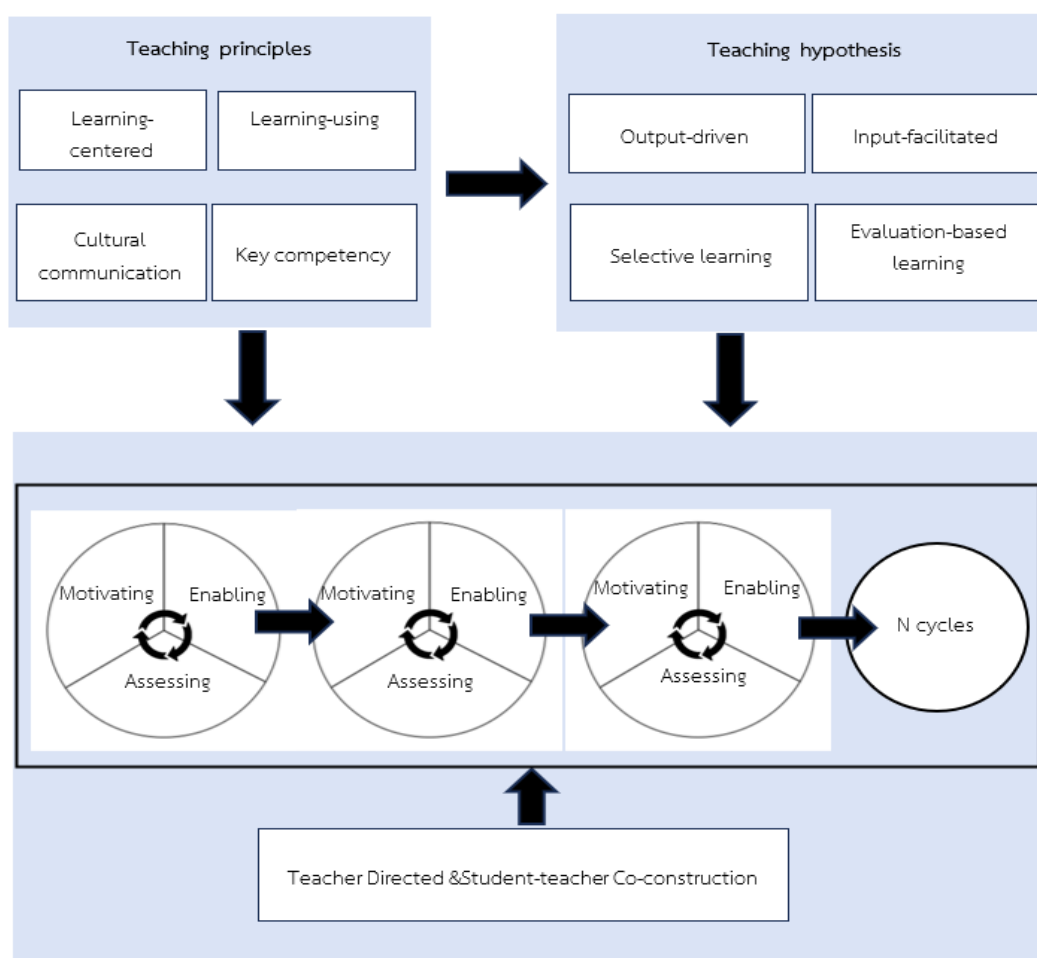

Figure *2.* The re-revised POA system (Wen, 2018)

■ Methods

This study examined the differences between students using the E-writing and POA methods to enhance students' writing and learning motivation, as well as between students in the control group, who learn using traditional teaching methods, and those in the experimental group, who learn using the new teaching methods. The following sections provide a detailed description of the experiment.

Participants

The final valid sample of this study consisted of 50 junior high school students in Chiang Mai, Thailand, who were beginners in learning Chinese. There were 25 students in the experimental group and 25 in the control group. The experimental group used E-writing and handwriting aids to learn Chinese writing and were able to complete exercises with the help of electronic devices. The control group used traditional

handwriting methods to learn Chinese writing without the aid of any electronics. Detailed information on gender, age, and grade is shown in Table 1:

Table 1

Demographic Characteristics of Participants by Group

Variable	Category	Experimental (n=25)	Control (n=25)
Gender	Male	7 (28.0%)	8 (32.0%)
	Female	18 (72.0%)	17 (68.0%)
Age	13-14 years old	18 (72.0%)	12 (48.0%)
	15-16 years old	7 (28.0%)	13 (52.0%)
Grade	Grade 8	15 (60.0%)	0 (0.0%)
	Grade 9	10 (40.0%)	25 (100.0%)

Research Instruments

This study primarily utilized a Learning Motivation Questionnaire as a research instrument to systematically gather and analyze data on students' motivation to learn Chinese writing in both experimental and control groups, thereby facilitating the attainment of the research aims. The questionnaire applied from Glynn et al. (2011) and Daungcharone et al. (2020), which is used to measure the students' learning motivation in four dimensions, Intrinsic motivation, Self-efficacy motivation, Self-determination motivation, and Grade motivation, focuses on the relationship between students' motivation and their academic performance, particularly in the context of grading. To evaluate the motivation to learn, the principle of questionnaire design is random sorting. Use concise, easy-to-understand, and clear words. A questionnaire is a form of motivation that utilizes the Likert scale, which consists of five levels: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree).

The second tool consists of pre-tests and post-tests administered in a paper-and-pencil format. The test content is appropriate for the students' level of Chinese, and the pre-tests and post-tests are all at the same level of difficulty. The content's difficulty level is based on the International Chinese Proficiency Test (Zhonghua Renmin Gongheguo Jiaoyubu, 2021), the Chinese Proficiency Test (HSK, Hankao International, 2021), and the Standard Chinese Language Test of the Ministry of Basic Education of Thailand (Thailand Ministry of Education,2008). The two test papers are based on HSK writing and are designed to assess how well students utilize various sentence patterns, how accurately they write Chinese characters, how fluently they express themselves in Chinese, how logically they structure their paragraphs, and how creatively they convey their thoughts in Chinese. The pre-test results will be used to group students, create personalized lesson plans, and inform future research comparisons. After the experiment, the students' Chinese skills will be assessed to determine how well they have improved. The post-test will compare and analyse the changes in students' Chinese writing vocabulary and grammatical accuracy before and after the experiment. It will also compare students' progress before and after using E-writing, which will help us understand how well they learned after the experiment. Then, Rubrics are tools used to assess and evaluate students' Chinese writing abilities. They usually include several

separate scoring criteria to fully understand the writing level, including vocabulary use, grammatical accuracy, content completeness, logical structure, and task completion.

Here, we refer to the HSK writing scoring criteria as the Second Language Examination writing scoring criteria. First, the HSK exam has strict and clear level divisions, as well as divisions for vocabulary and grammatical difficulty. According to Table 2, it can be observed that the HSK writing test emphasizes the accuracy of Chinese character writing and the completeness of vocabulary use. According to the assessment requirements of content, vocabulary, grammar, and Chinese characters, etc., it is divided into four levels: zero score, low score, medium score, and high score.

Table 2

HSK Writing scoring guidelines

Score Level	HSK Scoring Criteria Summary
0 points	Blank
Low-level score	Incomplete use of required words, incoherent content, grammatical errors, or numerous character mistakes
Mid-level score	Coherent content but with grammatical errors, a few character mistakes, or insufficient length
High-level score	All required words used, rich content, clear logic, no character mistakes or grammatical errors

Experimental Procedures

In this experiment, two groups of students, an experimental group and a control group, received the same teaching content but utilized different methods and tools. The process involved five key steps:

1) Explaining the research objectives and dividing students into groups through purposive sampling.

2) Conducting pretests to assess the students' Chinese writing levels and ensure comparability between groups.

3) Initiating learning with a focus on recognizing Chinese characters, using handwriting and typing to aid expression.

4) Started learning, using the POA framework, with different tools for the two groups: the control group primarily used handwriting; the experimental group used the Padlet platform (keyboard input) for E-writing. The specific process was as follows:

- Motivating Step: Assigning problem tasks to stimulate students' learning motivation and desire to express themselves through authentic questions, while also using the Padlet to briefly introduce their friends.

- Enabling Step: The teacher completed the teaching content, teaching core vocabulary and writing frameworks, and provided rich language input texts, vocabulary, and learning scaffolds to help students master the language knowledge and skills needed to complete the output tasks. Simultaneously, video teaching materials were used to assist students' understanding. Students opened the Padlet keyboard to write initial drafts based on the texts, completed exercises according to the learned framework, and published their initial drafts to the Padlet platform.

- Evaluating Step: Showcase students' writing achievements and provide feedback and analysis.

5) Performing a final test to evaluate writing skills.

6) Administering a questionnaire to measure the effectiveness of E-writing and students' learning efficacy.

■ Results and Discussion

Based on the research questions, this study examined the impact of using E-writing applications as supplementary resources on students' motivation to learn Chinese writing and their learning achievement. The experimental results are as follows.

Results of students' Chinese writing learning motivation

A one-way MANOVA was used to evaluate students' motivation to learn Chinese writing across different teaching approaches. The first group is the experimental group, which assigns students to learn Chinese writing using the E-writing + POA, and the control group, which assigns students to learn in the traditional learning style. The teaching approach is used as the independent variable, and the scores for the four motivation dimensions (intrinsic, self-efficacy, self-determination, and grade) are used as the dependent variable.

Table 3 presents that the students' learning motivation between the experimental and control groups is statistically significant only in the intrinsic motivation dimension (as shown in Table 3) and is not statistically significant in three other dimensions (self-efficacy, self-determination, and grade) with respective differences (as shown in Table 3). In addition, table 3 and Figure 3 show that students who learn Chinese writing with the E-writing + POA as a support tool have higher motivation in all dimensions ($M = 3.99$, $SD = 0.70$; $M = 3.51$, $SD = 0.87$; $M = 3.85$, $SD = 0.75$; $M = 3.98$, $SD = 0.64$, respectively) than those students who learn in the control group with the traditional teaching approach ($M = 3.32$, $SD = 0.85$; $M = 3.15$, $SD = 0.80$; $M = 3.42$, $SD = 0.79$; $M = 3.58$, $SD = 0.92$, respectively).

The results indicate that learning Chinese writing with the E-writing + POA can promote students' learning motivation higher than those who learn in the traditional approach with only handwriting, as shown in Table 3 and Figure 3.

Table 3

Results of one-way MANOVA in students' motivation to learn Chinese writing between different teaching approaches

Motivation Dimension	Teaching Approach	N	M	SD	MS	$F_{(1,47)}$	η^2
Intrinsic Motivation	E-writing + POA	25	3.99	0.70	5.645	9.370[*]	0.163
	Traditional	25	3.32	0.85			
Self-Efficacy Motivation	E-writing + POA	25	3.51	0.87	1.620	2.329	0.046
	Traditional	25	3.15	0.80			
	E-writing + POA	25	3.85	0.75	2.333	3.908	0.075

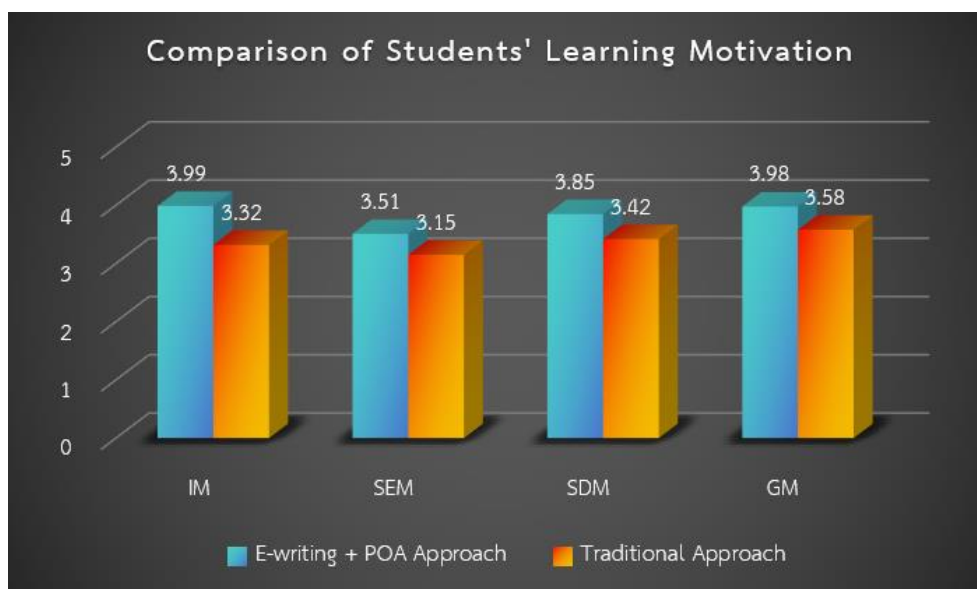| Motivation Dimension	Teaching Approach	N	M	SD	MS	$F_{(1,47)}$	η^2
Self-Determination Motivation	Traditional	25	3.42	0.79			
Grade Motivation	E-writing + POA	25	3.98	0.64	1.921	3.088	0.060
	Traditional	25	3.58	0.92			

*p < .05

Figure *3*. The comparison of the motivation between different teaching approaches

Results of students' Chinese writing achievement

A one-way ANCOVA was used to evaluate the Chinese writing achievement of students who learn in different teaching approaches, which include experimental group students who learn Chinese writing with the E-writing + POA and control group students who learn in the traditional learning style. The teaching approach is used as the independent variable, the pre-test score is used as the covariate variable, and the post-test score is used as the dependent variable.

Table 4 presents the results of students who learn in different teaching approaches, exhibiting statistically significant differences (as shown in Table 4). The usefulness of E-writing and POA can improve students' Chinese writing achievement (M = 11.36, SD = 2.55) compared to those in a traditional teaching approach (M = 8.12, SD = 2.32).

The E-writing + POA approach demonstrated effectiveness in improving student Chinese writing performance, particularly in promoting sustained progress during the intervention period. The descriptive data presented in Table 4 and Figure 4 show that students in the E-writing + POA group not only achieved higher post-test scores but also showed greater progress (3.88) compared to the traditional teaching group (1.60).

Table 4

Results of one-way ANCOVA in Chinese writing achievement between different teaching approaches

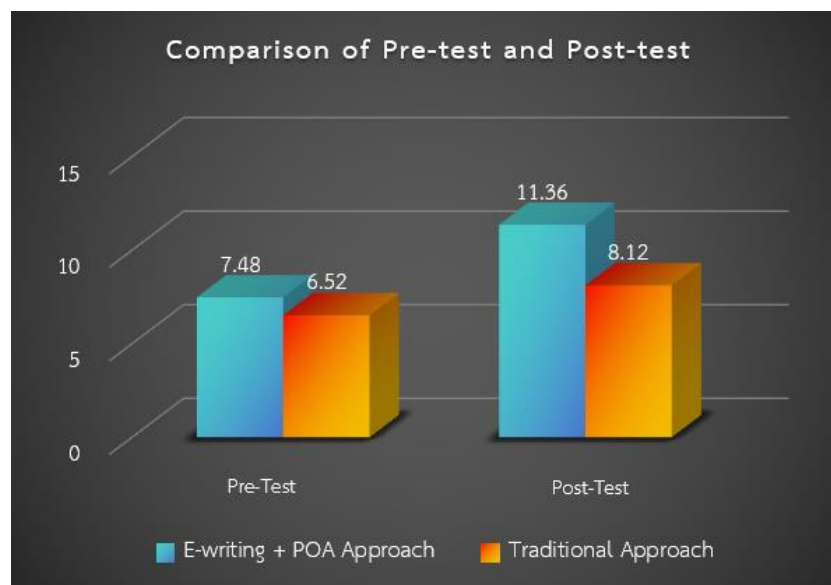| Teaching approach	N	M	SD	MS	$F_{(1,47)}$	η^2
E-writing + POA	25	11.36	2.55	84.198	31.688[*]	0.403
Traditional	25	8.12	2.32			

*p < 0.05

Figure *4*. The comparison of the Pre-test and Post-test between different teaching approaches

Discussion

     This study investigates the Chinese writing learning method that integrates E-writing with the POA method, aiming to enhance students' enthusiasm for Chinese writing (RQ1), improve their proficiency in Chinese writing (RQ2)

     RQ1 has been validated. A one-way MANOVA revealed significant differences in learning motivation between the experimental and control groups on the intrinsic motivation dimension (see Table 3). Although the differences in the other three motivational dimensions (self-efficacy, self-determination, and achievement orientation) did not reach statistical significance, the self-determination and achievement orientation dimensions were close to the significance threshold, indicating an overall upward trend in motivation. Meanwhile, the experimental and control groups had some differences in grade level, but preliminary analysis showed that the grade difference did not have a significant impact on the motivation improvement effect, and it also reduced confounding variables caused by the different grades. This may be related to the relatively similar cognitive development levels of students in this age group. In actual teaching, students demonstrated higher participation in E- writing tools, actively using them and the composition scaffolding provided under the POA method to complete their writing. This finding is consistent with

previous research results, namely that E- writing tools combined with POA can effectively stimulate students' motivation to learn Chinese writing (Coss, 2024; Zhai, 2024; Zhu & Bai, 2019). In summary, the combination of E- writing and POA may have different impacts on different motivational dimensions, with intrinsic motivation being the most core type and most easily influenced by E-writing and POA methods.

Research question 2 has also been significantly addressed. A one-way ANOVA revealed a statistically significant difference in writing scores between the experimental and control groups. The results indicate that the experimental group, which used the "E-writing + POA" teaching method, achieved higher writing scores than the control group, which used the traditional teaching method, as shown in Table 4. Students in the E-writing + POA group not only achieved higher scores in the post-test but also showed greater improvement, as shown in Figure 4. Combined with Table 1 and the preliminary analysis, age and grade level had no significant impact on academic performance, reducing confounding variables caused by developmental stage differences. Therefore, it has been confirmed that E-writing and POA can improve learning efficiency, significantly increase learners' text output, and enhance students' Chinese writing ability (Coss et al., 2024; Feng & Wu, 2024). Furthermore, compared to the control group, the experimental group showed more significant progress during the intervention period. The POA teaching method's "motivating-enabling-assessing" model (Wen, 2018), combined with the technical support of E-writing platforms, provides students with a more structured and supportive learning environment, which may be the primary reason for their improved writing skills.

In summary, integrating E-writing platforms with the POA method can significantly enhance the intrinsic motivation and writing performance of Thai junior high school students in learning Chinese writing, making it an effective and promising innovative method for teaching Chinese writing.

■ Conclusion

This study systematically examined the impact of combining E-writing with POA on the learning motivation and writing proficiency of Thai junior high school students in Chinese writing, confirming the significant benefits and great potential of this innovative model. The results show that this not only brought a statistically significant improvement in intrinsic learning motivation, effectively stimulating students' enthusiasm for learning Chinese writing, but also significantly outperformed traditional teaching methods in terms of writing performance and the magnitude of progress. The application of the E-writing application perfectly matches the structured and supportive learning environment required by the POA teaching method's "motivating-enabling-assessing" cycle. Therefore, this study confirms that "E-writing + POA" is an efficient and promising innovative method for Chinese writing instruction, providing empirical evidence for the digital transformation of global Chinese education. Future research could further explore the integration of more refined automated task generation and error correction functions into the E-writing platform and conduct long-term follow-up studies to assess the lasting impact and adaptability of this model on different learning groups and higher-level Chinese writing skills.

■ Limitations and Recommendations

Limitations

First, while a sample size of 50 students (25 per group) is sufficient to detect large effects, it may limit the statistical power to detect smaller but meaningful differences, particularly in inter-group comparisons of gain scores. The marginally significant results of the relationship between self-determination and grade motivation, as well as gaining scores, suggest that a larger sample may reveal additional significant effects. Future studies using larger samples will provide more definitive evidence of the intervention's effectiveness across all measurement dimensions.

Second, the study duration may be somewhat short and insufficient to fully assess the lasting effects of E-writing combined with the POA. Questions remain regarding whether the observed motivations and learning outcomes persist over time and whether they translate into broader Chinese language competence, extending beyond writing skills. Longitudinal studies tracking students over multiple semesters will provide valuable insights into the persistence of these effects.

Furthermore, this study specifically focused on Thai junior high school students learning Chinese, which may limit its generalization to other age groups, educational levels, or cultural contexts. The effectiveness of E-writing and POA instruction may vary depending on students' developmental stage, prior language learning experiences, and cultural attitudes towards the use of technology in education. Cross-cultural replication studies would be valuable in determining the broader applicability of these findings.

Recommendations

First, future research needs to validate and expand this study using larger and more diverse samples. Studies involving multiple schools, different grade levels (primary, secondary, and university), and diverse cultural backgrounds will help determine the universality of e-writing and the POA method across different educational settings.

Second, long-term longitudinal studies of students will provide valuable insights into the lasting impact of technology-enhanced POA teaching methods, assessing improvements in student motivation and retention of writing skills, as well as transfer effects on other language competencies such as reading, speaking, and listening.

Finally, future research could explore whether similar technology-enhanced POA teaching can effectively improve students' speaking, listening, or reading skills, or whether it can be applied to the teaching of language elements such as Chinese grammar, vocabulary, or culture. This would help us gain a deeper understanding of the method's potential applications.

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