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From Pen to Pixels: Enhancing EFL Learners' Writing Abilities Through the Use of Inquiry-Based Learning and Visual Literacy Model

PATSAWUT SUKSERM
Graduate School, Chulalongkorn University, Thailand
PUNCHALEE WASANASOMSITHI*
Language Institute, Chulalongkorn University, Thailand
Corresponding author email: punchalee.w@chula.ac.th

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Abstract

Writing is one of the most crucial skills for EFL students and also one of the most difficult to acquire. Many students face difficulties when it comes to writing in English. To address this challenge, this study examined whether or not combining inquiry-based learning with visual literacy could enhance EFL students' writing proficiency in four areas: content, organization, grammatical structures, and vocabulary. An intact group of 20 secondary school students from a private school in northeastern Thailand participated in this mixed-methods study, and data were collected using writing tests, student portfolios, and focus group interviews. Quantitative data were analyzed by means of descriptive and inferential statistics, while qualitative data were analyzed using content analysis. Results of the Wilcoxon signed rank test revealed a significant improvement in students' writing scores ($Z = -3.946^*$, $p < .05$) with a medium effect size after implementing the inquiry-based learning with visual literacy model. Qualitative analysis revealed that students actively engaged in the learning process, which helped enhance their writing ability. The study findings suggest that an inquiry-based learning with visual literacy model had a positive impact on EFL students' writing ability, as evidenced by the improved quality of their written texts. This study contributes to the existing literature on the use of inquiry-based learning to enhance EFL writing ability and emphasizes the importance of visual literacy in promoting student engagement and learning outcomes.

INTRODUCTION

The skill of writing is one of the four fundamental language skills in learning English as a foreign language (EFL) (Nunan, 1999). Writing proficiency is crucial for communicating and expressing ideas in academic, social, and professional settings (Hyland, 2003). This means that writing has been identified as a key predictor of academic success in higher education and future career advancement. However, EFL learners, for whom English is not the first language, may face particular challenges when attempting to develop their writing ability due to differences

in content, coherence, syntax, and lexical resources between their first language (L1) and the English language. Therefore, acknowledging the importance of writing in EFL settings is vital to developing effective language teaching strategies and enhancing students' language proficiency (Grabe & Kaplan, 1996).

Despite the importance of writing, many EFL learners also face various difficulties in mastering this essential skill. Some studies have investigated the challenges and difficulties that EFL learners encounter in writing. For example, according to a study conducted by Alsalami (2022), a significant proportion of students exhibit limited English writing skill practice. This is because writing in a second language can pose challenges not only of a linguistic nature but also of a sociocultural and rhetorical nature, which may hinder EFL students' ability to express their ideas effectively. Moreover, the writing process requires learners to integrate their prior knowledge, plan their texts, and revise them to convey their intended meaning clearly and successfully. In particular, when sharing viewpoints on different subjects, difficulties remain as some students may continue to struggle with expressing their individual perspectives effectively. Such a struggle arises because proficient writing demands a specific language skill set, cognitive understanding, and rhetorical abilities to create a coherent progression of ideas within comprehensible compositions (Wiboonwachara & Charubusp, 2022). To help learners achieve this, EFL instructors have been exploring various approaches to helping learners overcome the challenges they face. One of the approaches widely used by ELT practitioners is inquiry-based learning (Bybee et al., 2006; Rodriguez et al., 2019) where the learning process commences by sparking learners' curiosity about topics that interest them, hence leading them to generate questions, explore, and acquire knowledge to address questions. Inquiry-based learning provides an alternative to traditional teacher-centered approaches by offering authentic writing tasks, leading to a more meaningful and personalized learning experience for learners. Several researchers have found that Inquiry-based learning can enhance learners' writing ability as it develops their metacognitive strategies and reflective practices, which are essential for successful writing (Keeratichamroen & Phonnong, 2020; Maricimoi, 2017; Mutammimah et al., 2019; Navidinia et al., 2018; Palupi et al, 2020; Tayib, 2015; Yeom, 2018; Yunus & Chien, 2016).

What's more, inquiry-based learning has also been found to offer several advantages to EFL writing instruction. For instance, inquiry-based learning can promote learner autonomy and creativity in using the language, resulting in a more engaging and effective learning process. By providing learners with opportunities to practice writing in authentic contexts, inquiry-based learning can enhance learners' writing abilities and confidence, leading to improved writing quality, accuracy, coherence, and textual organization (Wiboonwachara & Charubusp, 2022). Overall, inquiry-based learning can be an effective approach to teaching writing in EFL settings by providing learners with a more meaningful and personalized learning experience that enhances their writing ability and metacognitive strategies.

However, although Rubio and Conesa's (2022) study has demonstrated that learners can achieve significant learning outcomes, as well as improved interest and motivation, fostering better academic results, when inquiry-based learning is used, it is noteworthy that learners may not always be fully engaged in the learning process, which can have negative effects on their

motivation and overall learning outcomes (Gill, 2005). Some learners may find inquiry-based learning activities boring or uninteresting, as they demand their constant attention and participation, leading to decreased engagement. To address these limitations and ensure the effectiveness of inquiry-based learning, an alternative instructional approach can be integrated into inquiry-based learning instruction, particularly visual literacy, which refers to the ability to interpret and create visual messages using various media and technologies (Hattwig et al., 2013). Visual literacy involves abilities to interpret, analyze, synthesize, and evaluate visual information, all of which are also the abilities required in order to be effective writers, so it can be used to enhance EFL writing ability (Maricimoi, 2017; Navidinia et al., 2018; Tayib, 2015; Yeom, 2018; Yunus & Chien, 2016). To explain further, with visual literacy, learners would be provided with opportunities to engage in creative and multimodal writing tasks that incorporate visual elements, such as images, videos, and infographics that can stimulate their imagination and creativity, bringing about to a more engaging and meaningful learning experience. Incorporating visual literacy into writing instruction has been shown to enhance learners' writing processes. Additionally, visual literacy can make writing tasks more engaging and meaningful, as learners can incorporate visual elements such as images, videos, and infographics to express complex ideas more effectively, as evidenced by several studies that have reported that incorporating visual literacy into EFL writing instruction can improve writing quality and effectiveness (Avgerinou & Pettersson, 2011; Chen & Liu, 2019; Cooper & Zimmerman, 2020; Gaciu, 2015; Hattwig et al., 2013; Michael et al, 2019; Tseng, 2020; Yeom, 2018)

Combining inquiry-based learning and visual literacy may further enhance learners' writing ability by providing a student-centered and engaging instructional approach. However, little research has been conducted on this model in EFL writing courses, particularly in the Thai context. Therefore, the purpose of this study was to investigate whether the inquiry-based learning and visual literacy model could be implemented to promote writing ability of Thai EFL learners.

Research objective

To investigate the effects of an inquiry-based learning with visual literacy model on writing ability of Thai EFL learners

Research question

What are the effects of an inquiry-based learning with visual literacy model on writing ability of Thai EFL learners?

LITERATURE REVIEW

Inquiry-based learning in teaching writing

Inquiry-based learning is an instructional approach that emphasizes active student engagement in questioning, investigating, and discovering knowledge. This student-centered approach has

been found to be effective in teaching writing as it provides opportunities for students to engage in meaningful writing tasks. Numerous studies have investigated the effectiveness of inquiry-based learning in EFL settings. For instance, inquiry-based learning has been shown to improve science process skills and academic achievement while engaging science students (Dampolii, 2020; Maxwell et al., 2015). In Thailand, Srisawasdi and Panjaburee (2019) implemented game-transformed inquiry-based learning to promote understanding of the chemistry subject, and found significant differences between game-transformed inquiry-based learning classes and traditional teaching. These findings indicate that inquiry-based learning can enhance student comprehension of subject concepts. Moreover, inquiry-based learning can be implemented at various educational levels, including primary school (Palupi et al., 2020), secondary school (Imansyah et al., 2019), undergraduate and graduate social work programs (AbuRezeq, 2018), the International Baccalaureate primary years' program (Mutammimah et al., 2019), and vocational high school (Nurlaela et al., 2018), among others. These studies show that inquiry-based learning can be used in a wide range of subject matters and with students of varying proficiency levels.

Several studies have demonstrated that inquiry-based learning can enhance students' writing skills and attitudes towards writing. For example, inquiry-based learning has been shown to have a positive impact on students' speaking ability, including vocabulary, grammar, fluency, and pronunciation (Yogi et al., 2019). Sari and Wati (2017) found that inquiry-based learning improved students' reading ability by encouraging them to take initiative, ask questions, conduct field observations, analyze data, and draw conclusions. This indicates that implementing inquiry-based learning in English teaching is beneficial for creating meaningful activities and increasing language proficiency. That is, researchers have shown a keen interest in using the concept of inquiry-based learning to develop better instructional models for teaching writing (AbuRezeq, 2018; Imansyan et al., 2019; Palupi et al., 2020; Tongjean et al., 2019). Palupi et al. (2020) found that inquiry-based learning was more effective than problem-based learning in teaching explanatory writing activities. AbuRezeq (2018), furthermore, demonstrated significant improvement in 3rd year students' writing performance, including identifying main ideas, posing questions, paraphrasing, narrating, problem-solving, and argumentation. Inquiry-based learning has also been shown to enhance students' ability to develop ideas and produce more detailed writing (Milatasari, 2013; Tongjean et al., 2019). These studies suggest that inquiry-based learning can be effectively applied to various levels of education, from primary school to higher education, and can improve writing skills in terms of quality, complexity, coherence, and fluency. In conclusion, these findings support the use of inquiry-based learning as an effective approach to teaching writing ability by engaging students in active learning.

Visual literacy in teaching writing

Visual literacy involves the ability to effectively interpret and create visual messages and representations, which is a critical aspect of teaching writing. Visual literacy provides students with the skills and tools to create engaging and effective visual aids to complement their writing. There are various visual literacy techniques that teachers can utilize in the classroom, such as pictures, graphs, mind maps, visual texts, semantic maps, videos, figures, photographs, illustrations, graphic organizers, symbols, and diagrams (Maricimoi, 2017; Navidinia et al., 2018; Tayib, 2015; Villasor, 2018; Wei et al., 2014; Yeom, 2018; Yunus & Chien, 2016).

Incorporating visual literacy into language instruction has been found to be highly beneficial for improving students' writing skills. Numerous studies have explored the positive impact of visual literacy activities on writing abilities. To begin with, Tayib's (2015) study revealed that using graphic organizers can enhance writing composition and lead to more words being produced by elementary school students. Similarly, Wei et al. (2014) showed that graphic organizers can boost writing skills such as generating ideas, supporting arguments, using cohesive devices, writing coherent paragraphs, and organizing essay content, for both college students and ESL learners. Gonzalez-Ledo et al. (2015) conducted research on the impact of computer graphic organizers on the narrative writing ability of elementary school students with specific learning disabilities. In terms of forms of visual literacy aids that can be utilized in the writing classroom, for instance, Maricimoi (2017) employed audiovisual media to increase writing skills of students and found that their achievement was significantly improved. Similarly, Yunus and Chien (2016) used a mind mapping strategy and found that most students had positive perceptions of the technique as it helped them plan their writing and gain a deeper level of understanding of the writing topics. Additionally, Yeom (2018), Navidinia et al. (2018), and Villasor (2018) employed picture media, picture book images, jigsaw images, painting, and videos to enhance various writing skills, such as writing a topic sentence, composing supporting sentences, using correct grammar and cohesive devices, and doing creative writing. All of these studies confirm the positive impact of visual literacy on development of writing in the EFL classroom.

Overall, incorporating visual literacy activities into language instruction can help students develop their writing skills by enhancing critical thinking, analyzing visual information, and improving written communication. Teachers can promote visual literacy in writing classrooms by incorporating visual aids into their teaching, encouraging students to analyze and interpret visual messages, and providing opportunities for students to create multimedia writing pieces. Therefore, visual literacy can be effectively employed in teaching writing as it provides students with the skills and tools to create engaging and effective visual aids to comprehend and complement their writing.

In conclusion, a review of inquiry-based learning and visual literacy in teaching writing has led to a conclusion that incorporating both inquiry-based learning and visual literacy in the educational arena offers a potential dual approach to teaching writing. Inquiry-based learning, by its nature, engages students actively in the learning process, urging them to question, investigate, and discover, which fosters a deeper understanding and improves writing abilities. On the other hand, visual literacy provides students with the necessary tools and skills to interpret and create visual aids, enhancing their capacity to communicate complex ideas effectively in their writing. By combining these two approaches, teachers can foster a comprehensive learning environment where learners not only actively participate in their learning journey but also learn to leverage visuals for better comprehension and expression. This synthesis could lead to richer, more detailed, and more coherent writing pieces, while also catering to diverse learning styles and improving overall engagement and retention of students.

METHODOLOGY

Research design

The current study utilized a mixed-method research design to gather data on the writing ability of EFL learners after an inquiry-based learning with visual literacy model was implemented. Specifically, a one-group pretest-posttest design was implemented to examine the effects of an inquiry-based learning with visual literacy model on English writing ability of Thai EFL learners. Additionally, student portfolio and semi-structured focus group interviews were utilized to further gather in-depth information from the students who participated in the study.

Participants

The study participants comprised 20 secondary students in grade 11 from a private school in Chaiyaphum province in Northeastern Thailand. They were assigned to the researcher as an intact group in the first semester of the academic year 2021. They ranged in age from 16 to 17 years old, with eight male and 12 female students taking part in this study. All students possessed comparable educational backgrounds, in line with the standard English curriculum of the school, signifying similar levels of basic English knowledge and learning opportunities. The average English proficiency level of the students was intermediate, and they were obligated to undertake nine hours of English studies per week, as per the school's requirements. The course's primary objective was to equip the EFL students with effective writing skills, with a particular emphasis on constructing well-crafted paragraphs centered on given topics. They were assigned a number from 1 to 20 to preserve their anonymity following approval granted by the Chulalongkorn University Ethical Review Board for Research with Human Subjects (IRB No. 153/2564). Additionally, the students provided informed consent, allowing data to be collected during classes for research purposes, publications, and conference presentations.

Research Instruments

The inquiry-based learning with visual literacy model

The inquiry-based learning with visual literacy model was designed to develop students' writing ability. It consisted of three units covering the topics of health, animals, and business, which were the topics based on main source: the textbook "Contemporary Topics 1, Intermediate" authored by Solórzano and Frazier (2016) and incorporated into the course, and it was implemented over a 12-week period. The instructional framework of the model was based on the 5E learning cycle (Bybee et al., 2006; Rodriguez et al., 2019) and the Association of College & Research Libraries (ACRL) Visual Literacy Standards (Hattwig et al., 2013). The 5E learning cycle encompasses five distinct stages: 1) "*Engage*" sees teachers igniting students' curiosity with stimulating activities, questions, or challenges that promote deep reflection; 2) "*Explore*" provides students a space to pose and answer their questions while testing on their notions, allowing for mistakes in a risk-free setting; 3) In "*Explain*" students convey their understanding and pinpoint key ideas they have gleaned; 4) "*Elaborate*" involves students deepening their knowledge by tying it in real-world contexts to gain personal experiences; and 5) "*Evaluate*"

encourages students to self-reflect, while teachers gauge how well they have met the lesson's objectives. The ACRL Visual Literacy Standards, adaptable across different educational settings, encompass seven core principles: 1) understanding the context and defining the use of images, 2) selecting appropriate image sources and understanding their pros and cons, 3) interpreting images and participating in related discussions, 4) evaluating image sources based on quality, 5) using images and effective communication about them, 6) creating images that convey concepts and using them creatively, and 7) correctly attributing images to respect creators' rights.

Therefore, combining both the adapted 5E learning cycle (Bybee et al., 2006; Rodriguez et al., 2019), emphasizing active student participation and aligning closely with the principles of inquiry-based learning and the ACRL's Visual Literacy Standards (Hattwig et al., 2013), providing teachers a practical guide for honing visual literacy across disciplines, preparing learners for a visually-driven world, is suitable for this study.

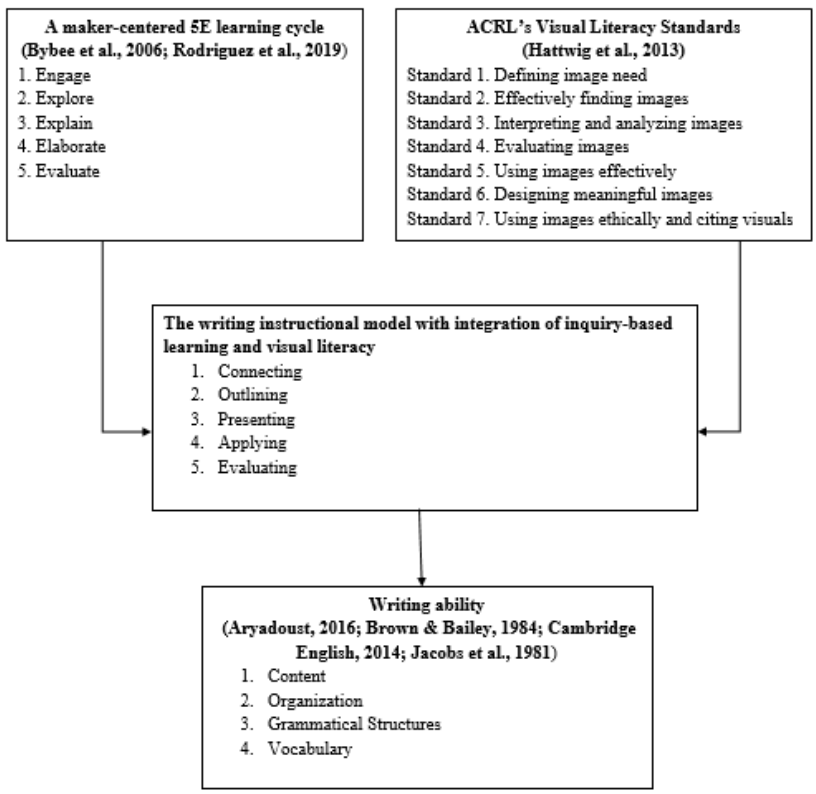

Figure 1 A summary of the conceptual framework of the study

Each unit in the model comprised five stages: Connecting, Outlining, Presenting, Applying, and Evaluating. The health unit spanned weeks 2 to 4, the animal unit weeks 5 to 7, and the business unit weeks 8 to 10, with each unit plan requiring 180 minutes of class time.

In the first stage, Connecting, the teacher began the class by providing the students with three visual materials related to current health disasters in Thailand. Following this, the teacher

asked the students three questions to ponder on: what they thought about the visual materials, what they noticed as the most significant part or element of the materials, and what the strengths and weaknesses of each material were.

After that, the teacher formed groups of four to five members and assigned them to answer the questions in the table format provided. The students were then asked to share their answers with the class while the teacher wrote down their ideas on the whiteboard. The teacher also introduced some health vocabulary and helped students to learn their pronunciation. In addition, the teacher explained the essential elements of critical thinking skills, such as reasoning, analyzing, and evaluating. Finally, each group was asked to select a topic that they were interested in learning more about, and they were encouraged to research and present their findings to the class in a subsequent session.

This stage stimulated student engagement with the topic, aligning with the engaging stage in the 5E learning cycle, while also promoting skills related to interpreting, analyzing, and evaluating visual materials. The writing activity aimed to enhance students' writing abilities by facilitating content development, idea organization, and recognition of structural and vocabulary elements.

Stage 2: Outlining involved students who would be asked to work in groups to select a picture related to topics in each unit, such as health disasters in Thailand that they found interesting. They also had to answer the question, "Why did your group select this picture?" and "Is it reliable?" to ensure they had chosen a suitable image. The teacher then emphasized the importance of giving credit to avoid plagiarism. Each group was assigned to design graphic organizers, such as mind map about the ideas from their chosen picture, including opinions related to health disasters in Thailand. Students worked together to design the mind map and ensure it had at least three branches, covering all aspects presented. Once the task was completed, the teacher asked each group to present their work in front of the class to explain what their picture was portraying. After the presentations, the teacher gave feedback on how to improve each mind map and listed any new vocabulary words from the students' work.

The exploration step in the 5E learning cycle was evident in this stage, as students engaged in research to find relevant information and visual materials to support their work. Visual literacy skills were also highlighted, with students tasked with selecting and finding appropriate images while citing sources ethically. Students' ability to design meaningful images was fostered through the creation of graphic organizers. Furthermore, the writing activity involved in this stage required students to expound upon their choice of pictures by providing detailed explanations, thereby strengthening their writing proficiency.

In Stage 3: Presenting, the writing task began with students being prompted to select a topic that they find intriguing and then proceed to craft a paragraph centered on that topic. Next, the students were expected to scrutinize a relationship graphic organizer, including a mind map, concept map, or hyperbolic tree and provided an elaborate explanation of their interpretation. The teacher then delivered a lesson on simple sentences to the class, after which the students submitted their writing for evaluation. The teacher then provided constructive feedback on each piece of paragraph writing, with the aim of enabling the students to identify

areas that required improvement. Finally, students were encouraged to enhance their writing further by generating additional ideas that could be incorporated into their paragraphs.

It is worth noting that this stage also necessitated the effective utilization of images, aligning with Standard 5, "Using images effectively," as students integrated their graphic organizers into their writing. The paragraph writing activity involved in this stage served to improve students' writing proficiency, targeting the content, organization, grammatical structures, and vocabulary of their written work.

In Stage 4: Applying, the teacher taught the graphic organizers specifically, specifically the hamburger paragraph. The teacher asked some questions to check the understanding of the concept of the hamburger paragraph with students, such as "What does this part represent?," "What do you think about the hamburger paragraph?," or "Apart from the hamburger paragraph, do you have any other ideas on ways to design a visual organizer?" Students helped each other answer the questions asked by the teacher in class. They shared ideas, made comments, or suggested something new to make the hamburger paragraph better. Each group was asked to apply the new knowledge to create a hamburger paragraph to help organize the presentation of the chosen topic. The teacher acted as an observer to monitor the behaviours of students while working in groups.

Afterwards, the teacher explained the elements of criteria for writing, which were content and organization. Students were then asked to individually revise and edit their opinion paragraph, which was based on the hamburger paragraph. They could add information, delete some unnecessary contents, or rearrange the order of ideas. By doing so, students were able to apply the knowledge they gained from the lesson and improve their writing skills.

The application of learned knowledge to new concepts in this stage aligned with the elaboration characteristic of the 5E learning cycle, while individual writing activities promoted progress tracking. The stage incorporated Standard 1, "Defining image need," as the teacher explained how hamburger paragraphs functioned. The designing of personalized hamburger diagrams highlighted Standard 6, "Designing meaningful images," and Standard 5, "Using images effectively." Students' writing ability was enhanced through the composition of an individual paragraph on a self-selected topic, improving content, organization, grammatical structures, and vocabulary.

Stage 5: Evaluating centered on assessing the writing tasks of students through peer feedback. The writing evaluation process began when the teacher introduced the rubric for paragraph writing, which included four aspects: content, organization, grammatical structures, and vocabulary. Then, the students were asked to evaluate their friends' work by providing feedback on the four elements related to graphic organizers such as the hamburger paragraph. They read the feedback from their friends and asked questions for clarification before submitting their final work. After all the work was collected, the teacher provided additional comments and feedback before the students collected their work in their student portfolios.

This stage promoted the development of writing abilities improved through the composition

of meaningful and informative comments on their classmates' work. Students were required to generate and organize ideas coherently and effectively convey their thoughts while being attentive to grammatical structures and vocabulary usage to ensure clarity and comprehension.

The writing test

The purpose of this study was to evaluate the effectiveness of an inquiry-based learning and visual literacy model on writing ability. The writing test was administered twice: once before the model's implementation as a pretest and once following the implementation of the model as a posttest to assess the students' writing ability. The test was developed by the researchers in compliance with the course objectives, which were to furnish EFL students with proficient writing abilities, primarily focused on crafting a well-constructed paragraph centered on a specified subject matter, and it required the students to write a paragraph of 120 to 150 words on a given topic related to health, animal, and business. The selection of this topic was based on key source: the textbook "Contemporary Topics 1, Intermediate" authored by Solórzano and Frazier (2016) and incorporated into the course. The students were instructed to select an appropriate illustration from various sources such as videos, websites, or infographics to complement their written work. The time required to complete the tests was 60 minutes. The test was submitted to a panel of experts who were experienced English instructors in language assessment and test development to ensure their content validity and language appropriateness. The students' writing abilities were evaluated in terms of content, organization, grammatical structures, and vocabulary, and to ensure scoring reliability, an inter-rater analysis was performed utilizing the Pearson's correlation coefficient. The computation of inter-rater reliability, based on the rubric scores, yielded a Cronbach's Alpha value of 0.866, indicating a high degree of consistency among raters. The other rater of the test was an English language teacher who possessed a minimum of five years of experience teaching EFL to Thai students.

The student' s portfolio

A portfolio was used to monitor the progress of the students' writing ability in this study. The portfolio contained assignments from each class session, including the students' personal information and the details of the learning unit, such as the date and the title of the chosen topic for each unit. After completing the group task, each group member collected their worksheet in the portfolio. At the end of each unit, students were prompted to engage in introspection regarding their work, utilizing a structured rating scale. This scale was delineated as follows: below 25% (1), 26% - 50% (2), 51% - 75% (3), and above 75% (4). It was specifically designed to assess their reflective insights into their writing abilities at each stage of the inquiry-based learning integrated with the visual literacy model. They were also asked to write down what they planned to do to improve their writing ability and how they would overcome problems and obstacles they may have had in the following unit. This method of tracking student progress was believed to be an effective way to assess their writing ability because it allowed them to reflect on their own learning, identify areas of weakness, and come up with strategies to improve their writing ability. The portfolio was used to monitor writing proficiency, collected regularly after each unit, and included three pieces of writing per unit on health, animal, and business. During the orientation week, students received training on portfolio use.

The semi-structured focus group interview

A semi-structured interview protocol was designed by the researchers to elicit more insightful information from the students about their writing abilities, including content, organization, grammatical structures, and vocabulary. The interview questions were validated using the Item-Objective Congruence Index (Henceforth IOC) by a panel of the three experts who also validated the writing tests. The semi-structured focus group interviews were conducted one week after the end of the model implementation. The students were selected based on their writing test scores, with two students having the highest scores (H1 & H2), two in the middle (M1 & M2), and two with the lowest scores (L1 & L2) in class. The interviews were conducted in Thai to overcome language barrier and audio-recorded for subsequent transcription. Each interview lasted approximately 15 to 20 minutes.

Data analysis

Regarding the quantitative data, due to the small sample size (n < 30), the Wilcoxon signed rank test, which is a non-parametric test, was used to analyze the pretest and posttest scores, as recommended by Kuntz (1997) that non-parametric tests be distribution-free and not require assumptions about the data distribution, making them less restrictive than their parametric counterparts. As for the qualitative data, content analysis with a coding method was employed.

FINDINGS

Effects of the inquiry-based learning with visual literacy model on students' writing ability

Table 1 presents the results of the Wilcoxon signed rank test conducted to compare the pretest and posttest scores of students as evidence of the effects of the inquiry-based learning with visual literacy model on students' writing ability. It was found that there were statistically significant differences in different aspects of writing ability between the pretest and posttest scores with a p-value of < .05 (p = .000).

Table 1

Pretest and posttest scores of writing ability of students

Aspects	Pretest		Posttest		Wilcoxon signed rank test		Effect Size
	M	*SD*	*M*	*SD*	*Z*	*P (2-tailed)*	*r*
Overall	4.93	0.57	10.55	0.60	-3.95	.00*	-0.62
Content	1.23	0.34	2.68	0.29	-3.99	.00*	-0.63
Organization	1.13	0.41	2.68	0.29	-4.03	.00*	-0.64
Grammatical structures	1.28	0.41	2.60	0.35	-3.96	.00*	-0.63
Vocabulary	1.30	0.38	2.60	0.31	-3.99	.00*	-0.63

*p < .05

Table 1 reveals that there was a significant difference between the pretest and posttest scores after the implementation of the model. Specifically, the posttest scores were found to be statistically higher than the pre-test scores, with a Z-score of -3.95 and $p < .05$. These findings demonstrate that the inquiry-based learning with visual literacy model could help improve the overall writing ability of the students following a 12-week implementation of the model. Additionally, the effect size r of the median scores of the writing test before and after the implementation was -0.62, which is considered a large effect size (Cohen, 1988; Rosenthal, 1996).

Regarding each aspect of writing, including content, organization, grammatical structures, and vocabulary, the Wilcoxon signed rank test also showed a significant difference between the pretest and posttest scores, with posttest scores being statistically higher than pretest scores (Z = -3.99, Z = -4.03, Z = -3.96, and Z = -3.99, respectively). The effect size r of the median scores for each aspect ranged from -0.62 to -0.64, which are also considered a large effect size. These results suggest that the inquiry-based learning and visual literacy model significantly improved each component of the writing abilities.

In addition to the results of the writing test, the rating the extent of students' own reflection on their writing ability enhancement at each stage of the inquiry-based learning with visual literacy model yielded further evidence of the effectiveness of the model implemented in the present study, as shown in Table 2.

Table 2
The rating of reflection on writing ability in each stage of the inquiry-based learning with visual literacy model

Stages	Unit 1		Unit 2		Unit 3	
	M	*SD*	*M*	*SD*	*M*	*SD*
Connecting	2.85	0.37	3.30	0.47	3.45	0.51
Outlining	2.80	0.41	2.85	0.37	2.90	0.31
Presenting	2.45	0.51	2.70	0.47	3.25	0.44
Applying	2.75	0.44	2.80	0.41	3.40	0.50
Evaluating	2.50	0.51	2.60	0.50	2.75	0.44
Total	**2.67**	**0.47**	**2.85**	**0.50**	**3.15**	**0.52**

Table 2 illustrates a steady increase in the overall mean scores of each unit, rising from 2.67 in Unit 1 to 3.15 in Unit 3. The connection phase had the highest mean score (M = 2.85; SD = 0.37), while the presentation phase had the lowest (M = 2.45; SD = 0.51). In Unit 2, the connection phase had the highest mean score (M = 3.30; SD = 0.47), while the assessment phase had the lowest (M = 2.60; SD = 0.50). As for Unit 3, the mean score for the connection phase was the highest (M = 3.45; SD = 0.51), while the mean score of the assessment phase was the smallest, which was similar to that of Unit 2 (M = 2.75; SD = 0.44).

To complement the quantitative data, the qualitative data obtained from the students' portfolios and the semi-structured interviews were analyzed and divided into four categories: content, organization, grammatical structures, and vocabulary.

The comments from the "Your actions" and "Your plan towards future work" in every unit were analyzed across the four elements of content, organization, grammatical structures, and vocabulary.

I. Content

The content creation process involved several steps, including the Connecting stage, where visual prompts were used to stimulate students' thoughts and generate ideas. As one student explained, "*I can remember memories from my childhood that I had to share with my friends*" (#student 4). Another student described how looking at pictures helped stimulate her mind: "*At this stage, by looking at the pictures, I am able to come up with more thoughts in my mind.*" (#student 8).

Furthermore, the outlining stage was another important step in content creation that allowed students to prepare their ideas before writing. By using graphic organizers and mind maps, students were able to see their ideas more clearly and were able to expand their ideas upon them. One student noted that having time to find information before writing allowed him to create more content: "*I feel good because I can write more because I have time to find the information I need before I write*" (#student 16). Another student described how mind maps helped expand her ideas, stating "*When I write, I can use a mind map to expand my ideas a lot*" (#student 18).

However, some students may have had struggled with content creation if they did not have enough information or were unable to select or present the information effectively, as one student stated, "*The topic I chose is interesting, but when I am looking for information, it's very difficult to choose the information I want to present*" (#student 3). Also, in the applying stage, some students may have struggled to present the content in English even if they knew what they wanted to say in Thai. One student noted, "*Sometimes I find it hard to write in English. But in Thai, I can get to the point*" (#student L2).

The present study analyzed data from participant interviews across three proficiency level groups, as determined by their writing test scores. The findings suggest that students with high and medium levels of proficiency demonstrated a more effective development of content creation ability, particularly in the business unit because they were familiar with the model and knew how to deal with information, as evidenced in the following excerpt, "*I was able to better select the information I presented in the last chapter about business because I am familiar with the stages*" (#student H1). Another student emphasized the importance of using credible sources which was one of the required elements in the outlining stage: "*In the outlining stage, I tend to use more credible sources to supplement my text to convince others, such as websites ending in .org*" (#student M2).

II. Organization

Using graphic organizers, such as concepts maps in the Outlining stage or hamburger paragraphs in the Applying stage, enabled students to enhance their writing ability by improving the

organization. One student reflected on the benefits of using concept maps as follows: "*I used to write without knowing the direction, but with concept maps, writing became easier and more convenient*" (#student 10), while another acknowledged the advantage of having a plan in place to write more quickly by using graphic organizers in the Presenting and Applying stages where students were required to use their own graphic organizers to help them write, saying, "*I feel like I can write more in time if I have a plan on how to get something down on paper, especially for the Presenting and Applying stages*" (#student 12).

Nonetheless, some students experienced difficulty in connecting information using hyperbolic trees in Unit 3 "Business." One of them explained, "*I have to admit that using the hyperbolic tree is a good method, but it's hard for me to write because I do not know what to connect to which parts*" (#student 7). Moreover, the middle and weaker proficiency groups suggested that other types of graphic organizers may be necessary to better organize information: "*I am curious if there are other types of graphic organizers than the ones we use in all these lessons, because if so, that would make the lessons even more interesting*" (#student M1).

Despite some limitations of graphic organizers, students still benefited from the use of graphic organizers in many stages. For example, high proficiency students found that the ability to connect ideas to multiple contexts could be developed in all writing-related subjects. This is possibly related to the Applying stages where students had to apply what they have known in other situations: "*I would use this association concept to write subjective exams in other subjects as well*" (#student H2).

III. Grammatical structures

The results indicated that the Evaluating stage can be valuable in improving grammatical structures, as students were required to review and comment on the work of others, thereby learning from others' mistakes and enhancing their own writing abilities, as one student put it, "*After reviewing my friend's work, I became a better reviewer and learned what to look for in my work*" (#student 14). Another student supported that some contents learned in the class could be used in the Evaluating stage "*Compiling the knowledge I have learned for other stages could help me evaluate my friends' work*" (#student 4).

However, some students still struggled with grammatical structures in their writing, highlighting the need for additional instruction and practices in areas such as subject-verb agreements and tenses because the model did not place its focus on those topics. It is evident in the Presenting stage where the teacher added some feedback into every piece of writing in order that students would know how to improve their writing. For instance, one student stated, "*When I write my work, I often get it wrongly when it comes to singularity. How do I use verbs?*" (#student 9). In other words, the lack of and the teacher's explicit instruction on some grammar contents such as subject-verb agreement and tense usage could bring about these difficulties. One student explained, "*I would like to see subject-verb agreement discussed before each lesson because I am not quite sure about that*" (#student L2). Additional support and guidance may be necessary to help these students improve their writing ability. Likewise, another student admitted, "*I am always confused when writing about the use of the present or past tense in this type of*

information" (#student M1). Evidently, these were not sufficiently emphasized in the inquiry-based learning with visual literacy model.

Despite the lack of some grammatical contents, students were able to improve their writing abilities via giving feedback on the grammatical structures in their writing in the Evaluating stage, as one exemplified, "*By evaluating my friends' work, I have become more careful when I write my own work. It's like we know what the examiners are thinking about and what they want to see*" (#student H2).

IV. Vocabulary

Improvement in vocabulary is evident in each stage of the model. In the Connecting stage, every participant was required to introduce vocabulary words related to visual aids. During the Outlining stage, the teacher listed new vocabulary words from the students' work. As reported by some students, their vocabulary expanded through interaction with their peers, both during group works and while reading their peers' written work. For instance, one student stated, "*When I work in a group with friends, I feel that I have learned many vocabulary words from my friends*" (#student 4). Another student agreed, saying, "*When I look at my friends' work, I also learn more vocabulary and secretly write down expressions or phrases that I can later use in my work*" (#student 12). In the Presenting stage, students were prompted to select a topic that they found intriguing and then craft a paragraph centred on that topic. They were encouraged to enhance their writing further by generating additional ideas that could be incorporated into their paragraphs. This also helps improve their vocabulary size.

However, some students expressed concerns about their limited vocabulary size and their lack of knowledge of paraphrasing techniques when writing individually in the Applying stage. One of them reflected on this, saying, "*After writing by myself, I realize that I use the same words over and over again*" (#student 1), and other students shared this lack of necessary knowledge, "*My writing would be better if I knew how to paraphrase*" (#student 7) and "*When I started writing for a long time, I started using more repetitive words. I want the teacher to introduce techniques to avoid repetitive words, such as paraphrasing*" (#student L1).

Despite the somewhat limited impact on the expansion of vocabulary knowledge, students reported an increase in their vocabulary size through their interactions with peers. Collaborating with classmates provided some students with opportunities to expand their vocabulary without resorting to rote memorization. For instance, one student commented, "*It's a way to learn vocabulary without memorizing it.*" (#student H1). During the Evaluating stage, students evaluated their peers' work using the graphic organizer approach, such as the hamburger paragraphs, and were exposed to new vocabulary usage. Additionally, data obtained from interviews with students revealed that high-achieving groups tended to employ less common vocabulary, recognizing that such words could prove advantageous for standardized tests such as the IELTS and TOEFL they would have to take later on in life. This was evidence in one student's account, "*I would use fewer common words in the IELTS test because there is a scoring criterion for this area as well.*" (#student H2). This is one of the key features of inquiry-based learning that fostered students' engagement and encouraged them to improve their work.

DISCUSSION

The findings from both quantitative and qualitative data showed that integrating inquiry-based learning with visual literacy had a significant positive impact on students' writing ability in terms of content, organization, grammatical structures, and vocabulary. The mean score of the writing test improved from 4.93 to 10.55 after the implementation of the inquiry-based learning and visual literacy model. This could be attributed to the different stages of the model, such as the connection stage that involves collaborative writing and thinking with visual materials, which enhanced students' ability to use and produce visual materials in their writing. The outline stage exposed students to different writing styles and required them to create a graphic outline using words, phrases, or sentences, while the presentation phase helped students to practice creating sentences that connected their ideas. In the application phase, students learned to create graphical tools such as flowcharts or hamburger paragraphs to formulate their thesis statement and supporting details, and the evaluation phase required students to write feedback that could improve their writing skills. Systematically generating ideas is one of the key strengths of inquiry learning, and these instructional steps used in the present study facilitated the process (Bybee et al., 2006; Rodriguez et al., 2019). As Wale and Bogale (2021) recommend, it is important for researchers, teachers, and students to prioritize inquiry-based writing instruction in their academic pursuits. Furthermore, visual literacy, especially the use of graphic organizers, can improve writing ability by facilitating the organization, coherence, structure, depth, quality, accuracy, and relevance of students' writing (Gonzalez-Ledo, 2015; Maricimoi, 2017; Navidinia et al., 2018; Tayib, 2015; Villasor, 2018; Wei et al., 2014; Yeom, 2018; Yunus & Chien, 2016). As such, when they were combined in this study, positive results became evident.

With the five steps of the inquiry-based learning and visual literacy model, it was found that all areas of writing ability were developed simultaneously: content, organization, grammatical structures, and vocabulary. However, the results of the study showed that content and organization were the most developed aspects, while grammatical structures and vocabulary were the least developed. This may be due to the fact that students tended to focus more on generating ideas and organizing them logically, rather than paying attention to grammar and vocabulary usage, which required basic background knowledge. It is also possible that students struggled with vocabulary usage and grammatical structures because they were not familiar with the topic or lacked appropriate vocabulary. Al-Mekhlafi and Nagaranam (2011) found that learners still struggled with acquiring grammatical rules despite intensive teaching. Furthermore, the study was conducted over one semester, which may not have been sufficient to fully develop these skills. In other words, time constraints are a crucial issue to be aware of when implementing this model, as also suggested by Plengkham and Wasanasomsithi (2023) in their study.

Beyond discussing the overall impact of integrating inquiry-based learning with visual literacy on students' writing abilities, the four components—content, organization, grammatical structures, and vocabulary—are discussed in detail.

I. Content

Content in this research referred to the ability to present ideas relevant to the task and to address all issues raised in the task, with clarity in the thesis statement, main body, and conclusion (Aryadoust, 2016; Brown & Bailey, 1984; Cambridge English, 2014; Jacobs et al., 1981). The importance of providing relevant content to the task is emphasized in many studies. In the inquiry-based learning and visual literacy model, students had the opportunity to research information before writing during the outline phase, and this allowed them to deepen their understanding of the topic and build more knowledge before writing (Milatasari, 2013; Tongjean et al., 2019). This can be attributed to the principles of inquiry-based learning, especially during the exploring stage. At this juncture, students have the opportunities to pose and address questions, testing their ideas through trials and errors within a non-threatening environment (Rodriguez et al., 2019). This would be the chance to construct the knowledge before writing. Additionally, using graphic aids such as mind maps or concept maps allowed students to organize their ideas and elaborate further on them during the writing process. This practice resonates with the ACRL's Visual Literacy Standard 6 because students could create images and visual media to represent and communicate concepts, narratives, and arguments for a defined audience, construct accurate and appropriate graphic representations of data and information, plan visual style and design in relation to objectives, and use creativity to incorporate existing image content into new visual products. This result is consistent with the result reported by Wei et al. (2014) that graphic organizers can boost writing skills with generating ideas, supporting arguments, using cohesive devices, writing coherent paragraphs, and organizing paragraph contents, for both college students and ESL learners. However, it should be noted that some students may struggle to fully develop their ideas due to a lack of familiarity with the topic or a lack of background knowledge.

II. Organization

Organizational ability in writing is crucial for students to produce well-organized and logically arranged information with appropriate transitional words, conjunction words, or cohesive devices within paragraphs (Aryadoust, 2016; Brown & Bailey, 1984; Cambridge English, 2014; Jacobs et al., 1981). The use of graphic organizers, such as mind maps, during the outline lessons proved to be effective in developing organizational abilities. Cooper and Zimmerman (2020) supported the use of graphic organizers, such as concept mapping, to guide and refine the process of teaching and learning. Using conjunctions or pronouns can improve the flow of students' writing and help them communicate their ideas systematically when they have graphic organizers as a prepared plan. Although graphic organizers have been shown to enhance students' organizational skills in this study, it is important to note that graphic organizers may not be suitable for all students, so finding the appropriate graphic organizers is essential to help students achieve their full organizational potential, as revealed through interviews with the students in the present study. Fan and Chen (2021) advocate the use of graphic organizers, such as concept maps and argument maps, believing that they help students develop stronger argumentation ability and build effective argumentative structures, which is something that became evident in the present study as well. This finding resonates with Standard 5 of ACRL's Visual Literacy Standards, specifically the emphasis on "using imaging effectively." The standard

would underscore the importance of utilizing visual thinking skills for problem-solving and effective communication regarding images.

III. Grammatical structures

Research suggests that good grammatical structures, which involve writing a range of simple and complex grammatical forms with few errors in agreement, tense, word orders, articles, punctuation, capitalization, and pronoun references are essential for improving writing ability (Aryadoust, 2016; Brown & Bailey, 1984; Cambridge English, 2014; Jacobs et al., 1981). However, this skill was developed only to a certain extent in the present study. In the assessment phase, students needed to use their knowledge of grammar to review their classmates' work and provide feedback to help them learn. This aligns with the characteristics of the evaluation stage in inquiry-based learning (Rodriguez et al., 2019), where students demonstrate their grasp of the content through creation and undertake self-assessment, critically evaluating their own advancements as well as their peers. Therefore, the assessment phase emphasizes the integration of individual knowledge with collaborative evaluation, reflecting the core principles of inquiry-based learning. Despite efforts to improve grammatical knowledge, certain students may still experience difficulties with subject-verb agreement, potentially leading to lower scores in this area. This finding is in line with Chong and Yunus' (2019) study, which revealed subject-verb agreement (SVA) to be a common error made by students. In the outlining phase, some students had difficulty with word order, possibly due to uncertainty about how words could be arranged as in complete sentences. Unlike Yeom's (2018) and Navidinia et al.'s (2018) studies, which found that use of visual media such as picture books, jigsaw images, paintings, and videos, did not help, the present study found that grammar became more accurate when graphic organizers were used. This may have been because in this study, inquiry-based learning enabled students to acquire the knowledge of grammatical structures through collaborative idea-sharing and group activities which would be important learning elements for success in learning a second language (Rattanasak, 2023), as well as by providing feedback on their peers' work during the evaluation phase, while visual literacy, particularly Standard 5, which focuses on the effective use of images, assisted students in organizing their writing and employing sentence structures with greater precision. Therefore, the findings were different from those reported by previous studies that used either inquiry-based learning or visual literacy alone.

IV. Vocabulary

Apparently, vocabulary is important for writing ability (Aryadoust, 2016; Brown & Bailey, 1984; Cambridge English, 2014; Jacobs et al., 1981). The current study found that students' vocabulary improved, particularly in the idea exchange phase when students were required to learn vocabulary used by their classmates. Furthermore, during the outlining phase, where students exchanged additional information, they looked for the meaning of new words from different sources, hence a possible increase in vocabulary knowledge. This can be attributed to characteristics inherent to inquiry-based learning. Specifically, the engaging stage requires students to answer questions, allowing them to share and understand each other's perspectives. Similarly, the exploring stage promotes collaboration among students, fostering an exchange of ideas to build collective understanding. Such interactive stages might serve as catalysts for

vocabulary development. An example of the role of vocabulary in writing ability development became evident when students worked on paraphrasing tasks. According to Stander's (2020) study, inadequate vocabulary development may lead to difficulties with paraphrasing. In the writing phase of the application process, some students were unable to successfully perform paraphrasing tasks due to unfamiliarity with the vocabulary used in the original text. Thus, their limited pool of vocabulary could prevent them from understanding and effectively rephrasing the original text.

In conclusion, the findings of this study suggest that integrating inquiry-based learning with visual literacy into writing instruction is promising to enhancing students' writing ability. To be more specific, this model showed positive effects on content, organization, grammatical structures, and vocabulary, which are critical aspects of writing.

IMPLICATIONS OF THE STUDY FINDINGS

There are several pedagogical implications for teachers and educators who aim to improve students' writing ability with an inquiry-based learning with visual literacy model. Firstly, in this study, it was discovered that inquiry-based learning enhanced the structured knowledge acquisition in students by both enriching their understanding and motivating them to claim responsibility for their learning, particularly through its focus on questioning and discovery. Additionally, graphic organizers significantly improved students' comprehension of various content areas, as they provided clearer and more distinct visual representations. Therefore, if teachers would like to incorporate the inquiry-based learning with visual literacy model into their teaching, they need to ensure that students have enough background information before they start writing. This could be achieved by providing students with a variety of resources such as articles, textbooks, and multimedia materials to help them acquire background knowledge on the topic, encouraging students to conduct independent research and explore multiple sources of information to broaden their understanding, and utilizing a variety of graphic organizers to help students visualize and organize their thoughts more effectively.

Secondly, this study revealed that certain activities were not fully executed owing to time limitation. Hence, appropriate time allocation for each phase of the model is crucial. Stages, including outlining, require extended durations since students must first gather information. Without careful planning or sufficient time allocation, it could compromise the quality of their subsequent presentations to increase likelihood of successful implementation of the inquiry-based learning with the visual literacy model.

LIMITATIONS OF THE STUDY

The current study has some potential limitations that need to be acknowledged. Firstly, it spanned only 12 weeks, using the inquiry-based learning with visual literacy model to assess students' English writing improvement. Some stages, like outlining, might not have had enough time for optimal skill development. To address this, teachers could extend the study or allocate

more time to each writing stage, particularly outlining, allowing for better information gathering and skill development. This may result in more effective model implementation and improved learning outcomes. Secondly, course structure limitations hindered the researcher's ability to provide extra lessons for struggling students. Future research should involve participants with diverse proficiency levels to explore if additional lessons enhance learning outcomes for those with weaker writing abilities, contributing to a deeper understanding of supplementary instruction benefits in this context. Lastly, the fact that the model required peer feedback revealed that some students lacked experience in providing constructive comments. Educators should incorporate effective feedback techniques into the curriculum to better prepare students for meaningful peer evaluations so as to ultimately enhance the overall learning experience.

RECOMMENDATIONS FOR FURTHER RESEARCH

In light of the critical role that inquiry-based learning and visual literacy appear to play in enhancing students' writing abilities, it is recommended that future research be conducted to investigate alternative graphic organizers in the model to determine which graphic organizers would be effective for improving students' writing abilities. Moreover, research should be conducted to further explore if the inquiry-based learning and visual literacy model could increase students' writing ability of students with different levels of English proficiency as it was discovered in this study that high proficiency students benefit from using graphic organizers and receiving grammatical feedback, while middle and low proficiency students may require alternative organizers and linguistic support. Employing various graphic organizers can address diverse learning styles and preferences, leading to a more inclusive and effective approach to enhancing writing skills. This diversity helps students better understand, organize, and communicate their thoughts, thus improving their writing capabilities and academic success. Lastly, longitudinal research may be carried out to determine whether the effects of the inquiry-based learning and visual literacy model on students' writing development can be sustained over time.

CONCLUSION

The integration of inquiry-based learning and visual literacy in a writing instruction model appeared to be an effective approach to improve students' writing ability, leading to significant development as evidenced in this study. The model successfully enhanced writing ability in all components. Regarding content, the study results demonstrated that students could develop their ideas through idea-sharing with their peers, even though some students may have found it challenging to determine what to write as they were overwhelmed by the abundance of information. Concerning organization, the inquiry-based learning and visual literacy model was found to enable students to link ideas using connectors and cohesive elements. In terms of grammatical structures, students reported improving their grammatical accuracy, particularly when receiving feedback from others. Finally, as for vocabulary, students who conducted research before writing could use a more extensive range of vocabulary. That is, inquiry-based learning can significantly enhance students' writing ability in all components, including content

development through idea-sharing, organization through the use of connectors and cohesive elements, improvement in grammatical accuracy through feedback, and expansion of vocabulary through research. Similarly, visual literacy also plays a vital role in a writing instruction model as it enhances students' ability to interpret, analyze and create visual images that complement and reinforce their written work. Although it may be too strong a claim that the inquiry-based learning and visual literacy model worked well with all students, it still provided significant advantages which could improve writing ability in all four components, namely content, organization, grammatical structures, and vocabulary, an improvement which is sometimes difficult to achieve in a traditional writing classroom.

THE AUTHORS

Patsawut Sukserm is a PhD candidate in the English as an International Language Program at Chulalongkorn University Graduate School. He holds a B.A. in English (1st class honors) from Ramkhamhaeng University, a B.S. in Statistics and an M.A. in English as an International Language from Chulalongkorn University. His research interests encompass English language teaching, teaching second language writing, and language assessment and evaluation.
patsawut.sk@gmail.com

Punchalee Wasanasomsithi is an Associate Professor at Chulalongkorn University Language Institute and currently the Director of the English as an International Language Program. She holds a B.A. in English (2nd class honors) from Chulalongkorn University, an M.A. in Applied Linguistics and a PhD in Language Education from Indiana University, the U.S.A. Her research interests include language learning strategies, learner autonomy, and learning-oriented assessment.
punchalee.w@chula.ac.th

REFERENCES

AbuRezeq, R. S. (2018). A program based on the inquiry approach to develop the EFL majors' language performance at Al-Azhar University in Palestine. *Studies in Second Language Learning and Teaching, 8*(3), 457-474. https://doi.org/10.14746/ssllt.2018.8.3.6

Al-Mekhlafi, A. M., & Nagaratnam, R. P. (2011). Difficulties in teaching and learning grammar in an EFL context. *International Journal of Instruction,4*(2), 69-92.

Alsalami, A. I. (2022). Challenges of short sentence writing encountered by first-year Saudi EFL undergraduate students. *Arab World English Journal, 13*(1), 534-549. https://dx.doi.org/10.24093/awej/vol13no1.35

Aryadoust, V. (2016). Understanding the growth of ESL paragraph writing skills and its relationships with linguistic features. *Educational Psychology, 36*(10), 1742-1770. https://doi.org/10.1080/01443410.2014.950946

Avgerinou, M. D., & Pettersson, R. (2011). Toward a cohesive theory of visual literacy. *Journal of Visual Literacy, 30*(2), 1-19. https://doi.org/10.1080/1051144X.2011.601708

Brown, J. D., & Bailey, K. M. (1984). A categorical instrument for scoring second language writing skills. *Language Learning, 34*(1), 21-42. https://doi.org/10.1111/j.1467-1770.1984.tb00915.x

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). *The BSCS 5E instructional model: Origins, effectiveness, and applications*. BSCS. https://www.bscs.org/wp-content/uploads/2016/06/5E-Model-Origin-Effectiveness-Applications.pdf

Cambridge English. (2014). *Assessing writing performance – Level B1*. Cambridge English Language Assessment.

Chen, Z., & Liu, W. (2019). Learners' perceptions of collaborative digital graphic writing based on semantic mapping. *Computer Assisted Language Learning, 33*(7-8), 694-714. https://doi.org/10.1080/09588221.2018.1544912

Chong, X. T., & Yunus, M. M. (2019). The effects of Kagan cooperative learning structures in teaching subject–verb agreement among rural Sarawak learners. *Arab World English Journal, 10*(2), 151-164. https://dx.doi.org/10.24093/awej/vol10no2.13

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.

Cooper, Y., & Zimmerman, E. (2020). Concept mapping: A practical process for understanding and conducting art education research and practice. *Art Education, 73*(2), 24-32. https://doi.org/10.1080/00043125.2020.1715132

Damopolii, I., Keley, U., Rianjani, D. T., Nunaki, J. H., Nusantari, E., & Kandowangko, N. Y. (2020). Potential of inquiry-based learning to train student's metacognitive and science process skill. *Jurnal Ilmiah Peuradeun, 8*(1), 83-98. https://doi.org/10.26811/peuradeun.v8i1.351

Fan, C. Y., & Chen, G. D. (2021). A scaffolding tool to assist learners in argumentative writing. *Computer Assisted Language Learning, 34*(1-2), 159-183. https://doi.org/10.1080/09588221.2019.1660685

Gaciu, N. (2015). Mapping metacognition, lesson planning, and reflection for teaching and learning. *International Journal for 21st Century Education (IJ21CE), 2*(1), 61-68.

Gill, Z. (2005). Boys: Getting it right: The "new" disadvantaged or "disadvantage" redefined? *The Australian Educational Researcher, 32*(2), 105-124. https://doi.org/10.1007/BF03216830

Gonzalez-Ledo, M., Barbetta, P. M., & Unzueta, C. H. (2015). The effects of computer graphic organizers on the narrative writing of elementary school students with specific learning disabilities. *Journal of Special Education Technology, 30*(1), 29-42. https://doi.org/10.1177/016264341503000103

Grabe, W., & Kaplan, R. B. (1996). *Theory and practice of writing: An applied linguistic perspective*. Longman.

Hattwig, D., Bussert, K., Medaille, A., & Burgess, J. (2013). Visual literacy standards in higher education: New opportunities for libraries and student learning. *Portal: Libraries and the Academy, 13*(1), 61-89. https://doi.org/10.1353/pla.2013.0001

Hyland, K. (2003). *Second language writing*. Cambridge University Press.

Imansyah, I., Terasne, T., & Hartina, K. Y. (2019). The implementation of inquiry-based learning strategy to enhance students' writing ability in descriptive text. *Journal of English Language Education, 2*(1). https://doi.org/10.25078/yb.v2i1.998

Jacobs, H. L., Zinkgraf, S. A., Wormuth, D. R., Hearfiel, V. F., & Hughey, J. B. (1981). *Testing ESL composition: A practical approach*. Newbury House Publishers, Inc.

Keeratichamroen, W., & Phonnong, I. (2020). A comparison of learning achievement and communication skills for undergraduate students using 5E inquiry-based learning and phenomenon-based learning. *NRRU Community Research Journal, 14*(1), 21-34.

Kuntz, P. S. (1997). *Stateside and overseas students of Arabic: Beliefs about language learning*. ERIC Document Reproduction Service No. ED407835.

Maricimoi, A. (2017). Using audiovisual media to increase the writing skill of students. *SMCC Higher Education Research Journal, 4*(1), 51-56.

Maxwell., D. O., Lambeth, D. T., & Cox, J. T. (2015). Effects of using inquiry-based learning on science achievement for fifth-grade students. *Asia-Pacific Forum on Science Learning and Teaching, 16*(1).

Michael, O., Gamabri, I., & Bada, T. (2019). Efficacy of graphic organizer on primary school students' performance in cognitive writing skills. *International Journal of New Trends in Arts, Sports & Science Education, 8*(1), 67-75.

Milatasari, Y. U. (2013). Improving students' ability in writing through inquiry based learning. *English Education: Jurnal Pendidikan Bahasa Inggris Universitas Sebelas Maret, 2*(1), 9-16. http://jurnal.fkip.uns.ac.id/index.php/bhs_inggris/article/view/7878

Mutammimah, H., Rochsantiningsih, D., & Asib, A. (2019). Inquiry-based learning in English teaching at a candidate school of IB PYP: Implementation and benefits. *Langkawi Journal of the Association for Arabic and English, 5*(2), 115-126. https://doi.org/10.31332/lkw.v5i2.1297

Navidinia, H., Ozhan, A. R., & Younesi, A. (2018). Using pictures in the English as a foreign language (EFL) classroom: Exploring its potential contribution for developing students' writing skill. *Asia Pacific Journal of Educators and Education, 33*, 1-17. https://doi.org/10.21315/apjee2018.33.1

Nunan, D. (1999). *Second language teaching and learning*. Heinle and Heinle.

Nurlaela, L., Suparji, S., Budi, K., Pratama, S., & Irawati, Y. (2018). Inquiry-based learning to students' creative thinking skills in vocational high school. *Proceedings of the International Conference on Indonesian Technical Vocational Education and Association (APTEKINDO 2018),* 129-135. https://doi.org/10.2991/aptekindo-18.2018.19

Palupi, B. S., Subiyantoro, S., Rukayah, R., & Triyanto, T. (2020). The effectiveness of guided inquiry-based learning (GIL) and problem-based learning (PBL) for explanatory writing skill. *International Journal of Instruction, 13*(1), 713-730.

Plengkham, B., & Wasanasomsithi, P. (2023). Effects of integrated performance assessment modules on English speaking ability of Thai EFL undergraduate students. *LEARN Journal: Language Education and Acquisition Research Network, 16*(1), 448-472. https://doi.org/10.14746/learn.2023.16.1.10

Rattanasak, S. (2023). The interplay between the Internet-based reading resources and learner-to-learner interactions in blended language learning. *Online Journal of Communication and Media Technologies, 13*(2), e202321. https://doi.org/10.30935/ojcmt/13050

Rodriguez, S., Allen, K., Harron, J. R., & Qadri, S. A. (2019). Making and the 5E learning cycle. *Science Teacher, 86*(5), 48-55. https://doi.org/10.2505/4/tst18_086_05_48

Rosenthal, J. A. (1996). Qualitative descriptors of strength of association and effect size. *Journal of Social Service Research, 21*(4), 37-59.

Rubio, A. D. J., & Conesa, I. M. G. (2022). Inquiry-based learning in primary education. *Journal of Language and Linguistic Studies, 18*(2), 623-647.

Sari, F., & Wati, I. (2017). Enhancing students' reading ability through inquiry-based learning to EFL students. *English Community Journal, 1*(1), 1-10. https://doi.org/10.32502/ecj.v1i1.653

Solórzano, H. S., & Frazier, L. L. (2016). *Contemporary topics 1: 21st century skills for academic success*. Pearson Education.

Srisawasdi, N., & Panjaburee, P. (2019). Implementation of game-transformed inquiry-based learning to promote the understanding of and motivation to learn chemistry. *Journal of Science Education and Technology, 28*, 152-164. https://doi.org/10.1007/s10956-018-9754-0

Stander, M. (2020). Strategies to help university students avoid plagiarism: A focus on translation as an intervention strategy. *Journal of Further and Higher Education, 44*(2), 156-169. https://doi.org/10.1080/0309877X.2018.1526260

Tayib, A. (2015). The effect of using graphic organizers on writing (A case study of preparatory college students at UMM-AL-QURA university). *International Journal of English Language and Linguistics Research, 3*(1), 15-36.

Tongjean, W., Chusanachoti, R., & Makanong, A. (2019). Development of an instructional model based on inquiry-based learning and 360-degree feedback approach to enhance English argumentative writing ability of undergraduate students. *Journal of Education Studies, 47*(3), 55-68.

Tseng, S. (2020). Using concept mapping activities to enhance students' critical thinking skills at a high school in Taiwan. *Asia-Pacific Education Researcher, 29*, 249-256. https://doi.org/10.1007/s40299-019-00474-0

Villasor, H. B. (2018). Effectiveness of visual thinking strategy on creative writing skills among senior high school students. *Tin-aw, 2*(1). Retrieved from http://ejournals.ph/form/cite.php?id=13641

Wale, B. D., & Bogale, Y. N. (2021). Using inquiry-based writing instruction to develop students' academic writing skills. *Asian Journal of Second and Foreign Language Education, 6*(4). https://doi.org/10.1186/s40862-020-00108-9

Wei, J., Chen, J. C., & Adawu, A. (2014). Teaching ESL beginners metacognitive writing strategies through multimedia software. *The CATESOL Journal, 26*(1), 60–75.

Wiboonwachara, L., & Charubusp, S. (2022). Implementing Genre-Based Self-Regulated Instruction (GBSRI) to enhance the English writing ability of Thai undergraduate students. *rEFLections, 29*(3), 638–674.

Yeom, E. Y. (2018). How visual thinking strategies using picture book images can improve Korean secondary EFL students' L2 writing. *English Teaching, 73*(1), 23-40. https://doi.org/10.15858/engtea.73.1.201803.23

Yogi, I., Syahrial, S., & Dedi, S. (2019). The effect of using inquiry-based learning strategy on students' speaking ability (A case study at SMAN 7 Bengkulu Selatan). *Journal of Applied Linguistics and Literature, 3*(2), 155-164. https://doi.org/10.33369/joall.v3i2.6848

Yunus, M. M., & Chien, C. H. (2016). The use of mind mapping strategy in Malaysian University English Test (MUET) writing. *Creative Education, 7*(4), 687-696. https://doi.org/10.4236/ce.2016.74064