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Abstract

The present study aims to explore the effects of using a mind map on EFL students' L2 writing development through descriptive writing activities. Purposive sampling was used to recruit 30 Thai high school students. They were placed into three groups depending on their English proficiency, including advanced, intermediate, and novice, and data was gathered using quantitative and qualitative methods. A Pre-test and post-test, a participant observation, and a semi-structured interview were used as instruments. The results demonstrated an enlargement in post-test scores after EFL students used a mind map to write. Furthermore, the students had overall positive feedback on using a mind map to develop EFL writing performance. As a result, the significant findings of this study lead to educational suggestions concerning the importance of thinking tools regarding the connections between pictorial and written information.

Keywords: a mind map, EFL Students' L2 writing, descriptive writing

1. Introduction

Writing is the process of conveying ideas, feelings, and thoughts in written form while paying special care to use language as accurately as possible (Khairunisa, Nadrun, & Rachmania, 2018). Writing needs intensive thought to form ideas into a word, a word into a sentence, and a phrase into a paragraph while using the proper syntax (Sadiah & Royani, 2019). As Al-Ahdal and Alqasham (2020) noted that students who write in a second or foreign language in academic situations experience difficulties because they cannot generate ideas in writing. Besides, Thiel and Conroy (2022) highlighted the significance of writing abilities in light of the effect of impairments on the capacity to participate in society. Furthermore, writing is a way of life that helps people communicate, recall, and represent themselves as individuals (Al-Ahdal & Alqasham, 2020). Writing is particularly important since a large majority of students study English for academic and professional goals that need strong writing abilities (Bhowmik, 2021). Therefore, writing is a complicated construct supported by a writer's linguistic, cognition, transcribing, and social-emotional abilities (Kim et al., 2021).

1.1 The Difficulties of Second Language (L2) Writing of EFL Learners

Problematically, students who study English as a foreign language (EFL) often find it challenging to start writing. Most EFL learners have faced difficulties while writing in a foreign language, with few opportunities to practice. Although students have many ideas in their minds, they struggle to express their ideas in written form. Due to the restricted availability of English courses at Taiwanese universities, EFL students have limited opportunities to develop their English writing (Kao & Reynolds, 2017). In the Japanese EFL context, lower-level EFL students are confronted with difficulties posed by the differing rhetorical styles of Japanese and English, as well as the logical paragraph structure utilized in written English (Okada, 2018). In addition, Korean learners' employing lexical collocations in their L2 writing may be deeply entrenched in their overall L2 writing abilities and not only in their understanding of L2 collocations (Chang, 2018). Besides, the EFL Indonesian students also had linguistic, cognitive, and psychological problems while they engaged in writing activities (Toba, Noor, & Sanu, 2019).

1.2 Thai EFL Learners' L2 Writing Challenges

Thai EFL students are also confronted with difficulties in writing in English since most of them have low English proficiency, limited knowledge of English vocabulary, and few opportunities to practice English writing. For example, Khemanuwong and colleagues (2020) revealed that writing academic papers was a modest

challenge for Thai students. These Thai EFL learners were required to conduct research in English; consequently, they confronted several challenges with the complicated writing procedure. These EFL students also encountered difficulties with sentence structure, tenses, and vocabulary (Khemanuwong et al., 2020).

Thai University students face EFL writing competence, and the educator must be conscious of both the classroom setting and the instructional strategy (Thongchalerm & Jarunthawatchai, 2020). Likewise, in Thailand, university admission test methods that solely assess reading abilities and grammatical knowledge have resulted in a disregard for other skills in the classroom, particularly the productive skills of writing and speaking (Chanaroke & Niemprapan, 2020). Additionally, writing is a skill that must be developed by studying and practicing regularly. As Pitikornpuangpetch and Suwanarak (2021) remarked, beliefs might impact teaching processes and decision-making in the classroom, as well as shape the execution of pedagogical strategy, which can impact the outcomes of teachers' professional development as educators and the academic achievement of students. The overcoming writing obstacles, it is necessary to determine what factors could lead to students' success in their writing. As a result, teachers must teach students writing strategies and how to choose the most appropriate strategy. Therefore, researchers and EFL writing teachers must explore how EFL students acquire the ability to write in English.

2. Literature Review

2.1 The Writing Approach Used in the EFL Writing Activities

Writing is a process of organizing thoughts, structuring them into a logical and unified system where all the ideas are interconnected and linked to the overall idea. Azizi and colleagues (2021) emphasized that writing used to be seen as primarily a cognitive process, but more lately, there has been a shift to emphasize a social perspective. Learning to write also entails learning the strategies of self-regulating cognitive activities and procedures to allow for a better grasp of cognitive processes in collaborative learning contexts and the situations under which such environments offer more effective instructional choices (Jiang & Kalyuga, 2022). Furthermore, students who understand how to regulate collaborative writing techniques may be able to transfer their expertise while writing freely (Teng, 2020). Therefore, there is a call for an effective tool to assist writing processes in writing classrooms.

2.2 Using a Mind Map as a Tool to Enhance L2 Writing

A mind map is recognized as an essential component of the exploratory meaning-making process by being a design-creative activity that results in a material artifact (Grant & Archer, 2019). Mind maps also help memorizing material simpler and more enjoyable while facilitating the generation of associations in a more creative, analytical, and multidimensional manner than conventional note-taking (Buzan, 2018). Educators and researchers have begun to develop and use software mind mapping as a tool for several education-related purposes. Some software tools that have been developed for a mind map are FreeMind, NovaMind, OpenMind, XMIND, and iMindMap. As Ratheeswari (2018) points out, ICTs can provide opportunities for both students and teachers to adapt learning and teaching to individual needs. Changing societies are effectively forcing schools to respond properly to this technical innovation. Thus, new technologies enable a mind map to serve as a collaborative online negotiating tool (Araujo, 2019). As Grant and Archer (2019) stated that a mental and physical process, a mind map allows people to develop ideas in new ways, encounter and convert ideas, and then compose these into a significant arrangement on a medium of choice. Additionally, the most common instances of mind map usage are brainstorming sessions, storyboarding presentations, visualizing concepts, or as an ideas organizer - all these instances contribute to developing critical thinking and improving speaking, reading, and writing skills (Kireeva, 2019). So, students can use a mind map to imagine and explore connections between topics, visualize and investigate connections between ideas, grasp the links between concepts, and better understand those concepts as well as the domain to which they belong. Besides, Choudhari et al. (2021) explained that a mind map is a learning tool that only provides a visual representation of a topic. In sum, mind maps are viewed as a useful tool for assisting learners in generating their ideas and transforming those ideas into writing through visualization.

2.3 The Links between a Mind Map and L2 Writing

Mind mapping plays an essential role in second language writing. Because a mind map explains, compares, classifies, creates a sequence, and makes a conclusion, students may develop coherent, clear, structured, and memorable language. Additionally, Pradasari and Pratiwi (2018) determined that a mind map might be used to improve students' performance in writing procedural texts, as it helps students conceive and organize their thoughts in the pre-writing process. Moreover, mind maps help students to enhance their vocabulary by linking new and old words with visuals that aid in conveying meaning in a particular setting (Khusniyah, 2019). Furthermore, the use of mind maps can motivate the students to write, it does not only irritate the students' ideas

in writing, but students become self-regulation of what they are going to write and making them more motivated to finish their writing (Hasanah & Ali, 2020). A mind map may also be utilized as a writing instrument to help learners generate ideas, and in L2 writing, learners with strong motivation write in the target language because it interests them (Sabarun, El-Muslimah, & Muhanif, 2021). Consequently, Luangkrajang (2022) exposes that the usage of a mind map in English language classes can provide students the chance to be active learners by independently gaining facts, processing information, arranging specifics, and developing knowledge.

3. Method

3.1 The EFL Classroom Context

This research was carried out in an EFL classroom in a Thai high school. The EFL high school students were registered in the Fundamental English course for 20 weeks. These students studied English for two hours per week. In the EFL classroom context, the Thai EFL teacher mostly played a leading role in giving knowledge, and the EFL students used both Thai and English to communicate with the teachers and their peers.

3.2 Participants

Purposive sampling was employed to choose 30 high school students from a northern Thai school who were studying English as a foreign language to engage in descriptive writing. These Thai EFL participants attended two hours of English lessons every week. For collecting qualitative data from the participants, the participants were divided into three competency levels, including two novices, two intermediate, and two advanced writers, according to their results in the writing tasks.

3.3 Research Design

The research is a mixed-method design. Both quantitative and qualitative approaches will be integrated to collect data. This study is aimed at investigating the effects of using a mind map to enhance EFL learners' L2 writing development. Therefore, the research procedure was conducted as shown in Figure 1.
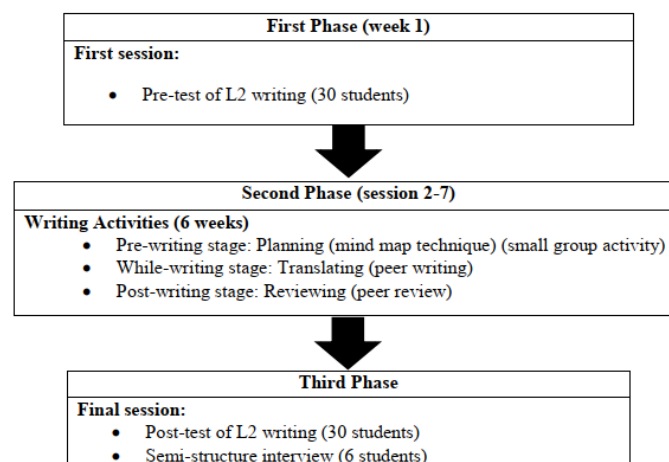
First Phase (week 1)

First session:

- Pre-test of L2 writing (30 students)

Second Phase (session 2-7)

Writing Activities (6 weeks)
- Pre-writing stage: Planning (mind map technique) (small group activity)
- While-writing stage: Translating (peer writing)
- Post-writing stage: Reviewing (peer review)

Third Phase

Final session:
- Post-test of L2 writing (30 students)
- Semi-structure interview (6 students)

Figure 1. Design processes of writing stages for this study

3.4 Instruments

The instruments used in this study included the pre-test/post-test CEFR vocabulary B1 level of L2 writing and the attitude questionnaire. First, the pre-test and the post-test were prepared for 30 participants that were asked to write an English paragraph which a minimum of 50 words within 20 minutes. The pre-test and the post-test were prepared under a writing topic, namely 'One Day in School'. The pre-test was prepared for the participants in the first week, and the post-test was administered to the participants in the last week. Second, the attitude questionnaire was adapted from Kamli (2019) to study students' attitudes towards using a mind map to enhance L2 writing before and after the English writing activities. The dimensions of enjoyment (5 items), ease (5 items), competence/ability (5 items), and writing method (5 items) were addressed in this 20-item attitude questionnaire. Five Likert scales ranged from 1 (strongly disagree) to 5 (strongly agree). The mean scores were interpreted as follows 1.00 - 1.80 (strongly disagree), 1.81 - 2.60 (disagree), 2.61 - 3.40 (neutral), 3.41 - 4.20 (agree), and 4.21 - 5.00 (strongly agree). In order to ensure the instruments' reliability, three experts were asked to rate the IOC and provide suggestions. Before employing these instruments, the researcher was granted a research ethic from Phayao University, Thailand, and the ethics number is UP-HEC 2.2/022/65.

3.5 Procedures

3.5.1 The Writing Activities

In this study, the EFL writing activities were conducted for six sessions; each session was two hours, totalling 12 hours. Thirty students who studied in the sixth grade were chosen by the purposive sampling participated. In each writing session, the students were required to participate in the English activities for three stages, namely the pre-writing stage, the while-writing stage, and the post-writing stage. In the pre-writing stage (planning 30 minutes), the EFL students were asked to plan their paragraph writing in small group activities by generating ideas, organizing ideas, and goal setting. Therefore, the EFL students utilized mind maps as a tool to enhance their writing performance.

First of all, the researcher presented a mind map sample and requested participants to discuss their prior knowledge of utilizing mind maps in everyday routine and to check their background knowledge about descriptive paragraph writing. Then, the researcher delivered a brief presentation on the necessary techniques of mind maps in English writing tasks. Finally, the EFL students participated in a variety of exercises to learn how to create descriptive paragraphs using a mind map according to six lesson plans which were managed for three stages within a limited time.

In this study, there were three stages of writing descriptive paragraphs. In the pre-writing stage (*Planning*), the EFL students used plain paper (A4 size) and colorful pens to prepare materials for creating mind maps. After that, the researcher demonstrated how to create a mind map by showing the mind map model with detailed clarifications. For the students' practice, the researcher divided the participants into five groups, with six members in each group. Then, the students were given the writing topic to make a note of the central theme. Next, the students started in the center of a blank page to brainstorm English vocabulary and draw branches and colors throughout the different subtopics that can be essential in grouping related ideas. Finally, the students were asked to create a mind map as an organization of descriptive paragraph writing. In the while-writing stage (*Translating*), the teacher provided and explained English vocabulary lists related to the given topic, coherence and cohesion in writing, the types of descriptive, and the descriptive paragraph writing model (hamburger paragraph writing). Then, the students and their peers wrote a descriptive paragraph by translating and composing the ideas they had done in the pre-writing stage. In the post-writing stage (*Reviewing*), the students were asked to review and evaluate their descriptive paragraph writing with their peers. Finally, the students revised their paragraph writing individually.

3.5.2 The Writing Instructions

This present research was carried out during writing sessions in an English classroom. The researcher, as the teacher, was a facilitator to guide information and explain what the students studied in the writing processes. Additionally, the researcher explained to the students what descriptive paragraphs were by encouraging them to think about paragraph writing organization. Then the teacher asked the students to write a descriptive paragraph by transforming ideas from the mind map that they created. Finally, the students were asked to submit their written work. Therefore, Hayes and Flower's (1980; 1981, p. 370) Cognitive Process Theory was used as the theoretical framework for this research study.
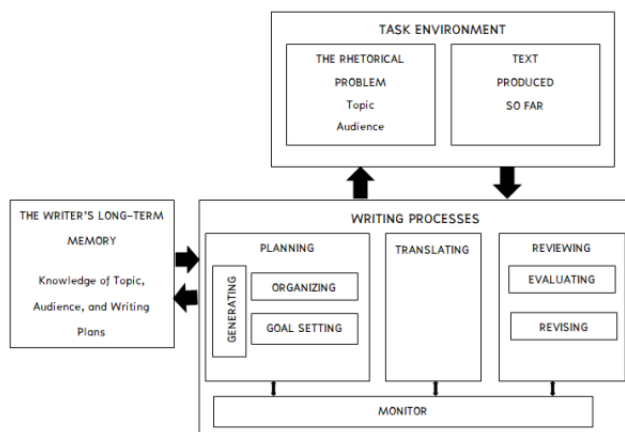
(Hayes and Flower, 1981, p. 370)

Figure 2. The cognitive processes for writing

According to Figure 2, the writing processes were conducted in three stages during the EFL writing activities of this study. In the *pre-writing stage (Planning)*, students were assigned to plan what they would write in a descriptive paragraph based on the given topic. They were encouraged to use a mind map to generate, organize ideas, collect information, take notes, and brainstorm. In the *while-writing stage (Translating)*, the students and their peers by creating a mind map and using the provided B1vocabulary lists in order to write the descriptive paragraph. In the *Translating* stage, the students translated their planned ideas and composed a descriptive paragraph. In the *post-writing stage (Reviewing)*, the students read through what they had written to review, evaluate, and revise their descriptive paragraph with their peers by using a self-checklist, making the necessary adjustments, and producing their final written product of the descriptive paragraph writing.

3.5.3 Mind Map as the Writing Intervention

During the writing activities, mind maps were created by the EFL students in order to assist their writing processes and enhance their writing abilities. Pre-writing is the primary stage of the writing process, and it is an important step to support the students in setting goals, organizing, brainstorming, and determining text structure. A spider map or a descriptive map was used to show details about people, places, or objects with key terms in the middle of the relationships to enhance students' descriptive writing skills. Mind maps were used to promote the students to generate additional concepts, connect the ideas of subtopics, and group related ideas through the colourful branches. Keywords or symbols related to the given writing topic were used per line to general ideas. In this stage of mind mapping, the B1 vocabulary list was provided to help the students transform their main ideas of writing through the colourful central image. Finally, the mind map, which was created by each student, was used as a guided tool with colorful images and words to model their descriptive paragraph writing in the next stage.
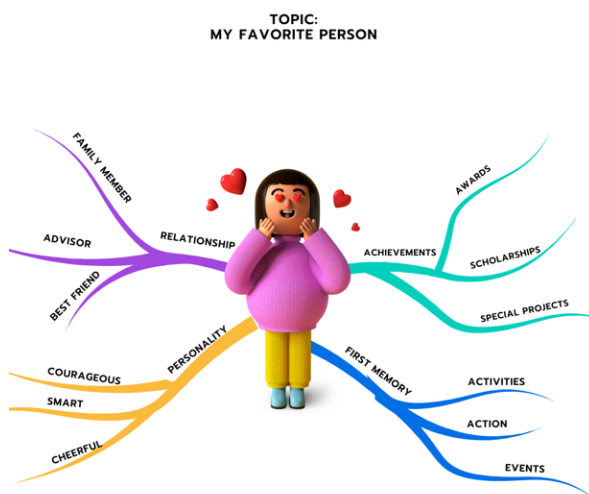

Figure 3. A sample of the mind map used in the EFL writing activity

4. Results

4.1 Effects of Using a Mind Map in Descriptive Writing Activities

The pre-test and post-test scores shown in Table 1 include the means $(\bar{\mathbf{x}})$ and standard deviation (S.D.), using a paired t-test to investigate the effectiveness of using mind maps to enhance Thai EFL students' writing performance.

Table 1. Thai EFL learners' pre-test and post-test scores

Tests	N	$\bar{\mathbf{x}}$	S.D.	t	Sig. (2-tailed)
Pre-test	30	14.30	2.04	26.25	0.00
Post-test	30	26.87	1.77		

As demonstrated in Table 1, the Thai EFL students' post-test English writing scores were higher than their pre-test scores after employing mind maps. The pre-test averages and standard deviations (S.D.) for EFL students were 14.30 and 2.04. In contrast, the post-test scores of these EFL students' (x) and S.D. were 26.87 and 1.77. This suggests that the EFL students scored higher after utilizing the mind map while participating in writing exercises. A comparison of the mean scores from the pre-test and post-tests reveals the extremely significant findings of the tests (0.00). The findings of this study demonstrated a substantial rise in comparing

post-test to pre-test scores on EFL students' English written products. In summary, using a mind map appears to improve EFL students' L2 writing development, as indicated by higher post-test results.

4.2 EFL Learners' Attitudes towards a Mind Map

To answer the research question "What are the effects of using a mind map on EFL students' L2 writing development?" this attitude questionnaire includes 20 items focusing on the EFL students' attitudes concerning enjoyment, ease, writing ability, and strategy use when they used mind maps in the descriptive writing activities. After the last session of this study, 30 EFL students were asked to answer this attitude questionnaire which was adopted from Kamli (2019). Table 2 below illustrates the results of thirty EFL students' attitudes toward using the mind map to enhance their English writing development.

Table 2. The EFL learners' enjoyment attitudes towards the mind map on their L2 writing development

No.	Statements	$\bar{x}$	S.D.	Interpretation
	Enjoyment			
1.	I enjoy constructing a mind map.	3.60	0.50	Agree
2.	I enjoy solving problems involving circular and rotational motion.	3.40	0.50	Neutral
3.	I feel relaxed when I write in English.	3.67	0.48	Agree
4.	I feel excited about writing in English.	4.37	0.67	Strongly agree
5.	I like people to read what I've written in English.	3.63	0.49	Agree
	Total	3.73	0.53	Agree

Table 2 shows that overall the EFL students agreed that they enjoyed using the mind map during writing descriptive paragraphs in English ($\bar{x}$ = 3.73, S.D. = 0.53). As can be seen, most EFL students strongly agreed with the statement in Item 4 that they "feel excited about writing in English" ($\bar{x}$ = 4.37, S.D. = 0.67). However, the student rated Item 2 as neutral, which was the lowest mean rank that they "enjoy solving problems involving circular and rotational motion" ($\bar{x}$ = 3.40, S.D. = 0.50).

Items 6 to 10 in Table 3 were used to measure the EFL students' attitudes towards the ease of using mind maps to assist the descriptive writing paragraph. The results are uncovered in Table 3 below:

Table 3. The EFL learners' attitudes towards the ease while using mind maps in the EFL writing activities

No.	Statements	$\bar{x}$	S.D.	Interpretation
	Ease			
6.	It's easy for me to write in English.	4.27	0.58	Strongly agree
7.	It's easy for me to remember information when I am writing in English.	3.97	0.56	Agree
8.	It is easy for me to organize my ideas when I write in English.	3.83	0.65	Agree
9.	It is easy for me to get ideas when I write in English.	3.63	0.49	Agree
10.	It is easy for me to write my ideas in English.	3.83	0.38	Agree
	Total	3.91	0.53	Agree

As seen in Table 3, the overall EFL students agreed that using the mind map during the English writing activities can assist their writing activities to be easy ($\bar{x}$ = 3.91, S.D. = 0.53). As can be seen, the EFL students achieved the highest mean scores for item 6; that is, using mind maps during the writing activities, they "feel easy to write in English" ($\bar{x}$ = 4.27, S.D. = 0.58). On the other hand, the statement Item 9 was rated the lowest rank among five items that "it is easy to get ideas when I write in English" ($\bar{x}$ = 3.63, S.D. = 0.49).

Items 11 to 15 in Table 4 were used to measure the EFL students' attitudes toward using mind maps to enhance the EFL students' writing development while engaging in descriptive writing activities. The results are uncovered in Table 4 below:

Table 4. The EFL learners' competence attitudes towards the mind map on their L2 writing development

No.	Statements	$\bar{x}$	S.D.	Interpretation
Writing Ability				
11.	I understand how to construct a mind map.	5.00	0.00	Strongly agree
12.	I can express my ideas when I write in English.	4.43	0.50	Strongly agree
13.	I think my English papers look good.	4.47	0.51	Strongly agree
14.	I have discussed a mind map with friends.	5.00	0.00	Strongly agree
15.	I get high grades for my English writing.	4.37	0.49	Strongly agree
Total		4.65	0.30	Strongly agree

As shown in Table 4, overall, the EFL students strongly agreed that using mind maps during the writing activities can enhance their descriptive writing performance ($\bar{x}$ = 4.65, S.D. = 0.30). Among five items, Items 11 and 13 were rated with the highest mean score ($\bar{x}$ = 5.00, S.D. = 0.00), reflecting a strongly agree level that they "can understand how to construct a mind map" (Item 11), and they "have discussed a mind map with friends". However, Item 15 gained the lowest mean score among the five items that the EFL students thought they "get high grades for their English writing" ($\bar{x}$ = 4.37, S.D. = 0.49).

Items 16 to 20 in Table 5 were used to measure the EFL students' attitudes towards the strategy of using the mind map to assist the descriptive writing activities. The results are shown in Table 5 below:

Table 5. The EFL learners' strategy uses attitudes toward the mind map on their L2 writing development

No.	Statements	$\bar{x}$	S.D.	Interpretation
Strategy Use				
16	Before writing, I outline the ideas I want to write.	4.50	0.51	Strongly agree
17	Before writing, a mind map helps me to mentally visualize the ideas I want to write.	4.53	0.51	Strongly agree
18	While writing, I think about the topic sentences I want to use.	4.30	0.47	Strongly agree
19	While writing, I think about the paragraphs I want to use.	4.43	0.50	Strongly agree
20	I apply what I learn to everyday life.	4.57	0.50	Strongly agree
Total		4.47	0.50	Strongly agree

As can be seen from Table 5, overall, the EFL students strongly agreed ($\bar{x}$ = 4.47, S.D. = 0.50) that using mind maps can promote their strategy use during writing activities. The students rated Item 20 as the highest mean score to reflect that they "apply what [they] learn to everyday life" ($\bar{x}$ = 4.57, S.D. = 0.50). However, Item 18 reflected the lowest mean score that the students strongly agreed that while writing in English, they "think about the topic sentences [they] want to use involving circular and rotational motion" ($\bar{x}$ = 4.30, S.D. = 0.47).

5. Discussion

This study studied the effects of using a mind map on EFL students' L2 writing development through descriptive writing activities. Hayes and Flower's (1980, 1981) Cognitive Process Theory was applied as a theoretical framework.

5.1 The Effects of Using a Mind Map on EFL Writing

The overall results of this study clearly indicate that the use of a mind map on EFL is linked to students' L2 writing development. The results of this study suggest that Thai EFL students can accomplish higher writing scores after using the mind map while engaging in writing activities. Similarly to the previous studies, the higher post-test results confirm that using mind mapping is effective for writing achievement and writing performance (Al-Zyoud et al., 2017; Karim & Abu, 2018; Kamli, 2019) and descriptive writing ability (Khusniyah, 2019). The post-test results of this present study also tie nicely with the statement of Al-Zyoud and colleagues (2017, p.

286) that "the mind mapping strategy was demonstrated as an excellent and innovative strategy as it enabled the participations students to generate new ideas for essays and assignments writing". In line with a previous study conducted by Alqasham and Al-Ahda (2021), the study also revealed that 40 Saudi EFL students' post-test results improved after the use of the concept mind map to develop their writing skills. The researchers mentioned that "mind mapping allows students the chance to reinforce their concepts before studying, so they can transfer meaning or write summaries efficiently" (Alqasham & Al-Ahda, 2021, p. 1150).

Similarly, the discovery of this current study is also dependable on Pribadi and Susilana (2021), who used mind mapping as a learning strategy to enrich primary school students writing skills. Based on the post-test result, the researchers concluded that using a mind map as a learning strategy can support students in writing their writing tasks. For this reason, Pribadi and Susilana (2021) claimed that using a mind map can help the learners to connect their prior and current understanding; consequently, "the mind map strategy makes it possible for them to create in-line ideas and themes which are significant in writing activities" (p. 915). Most of the studies on using a mind map to improve L2 writing always occur for university students; hardly use this technique at the high school level, especially in Thailand. Therefore, this study also confirms that the use of a mind map has a significant progressive effect on teaching L2 writing.

5.2 Thai EFL Students' Attitudes toward Using Mind Maps to Enhance Writing Performance

The results from the attitude questionnaire indicate, overall, that most Thai EFL students revealed positive attitudes toward the use of mind maps as a learning strategy to facilitate their descriptive writing paragraphs in terms of writing abilities, strategy use, ease, and enjoyment.

First, the results revealed that Thai EFL students showed a highly positive attitude toward the use of the mind map strategy to facilitate their *'writing abilities'* by discussing a mind map with friends while writing descriptive paragraphs. This finding is consistent with the study of Chairinkam and Yawiloeng (2021, p. 233) which revealed that "seeing listed ideas together on paper may aid the learners to make connections and look at their topics again from a new perspective" while engaging in the EFL writing activities with the peers. This finding also confirms a theoretical statement of Alquasham and Al-Ahdal (2021) that "since mind map is a constructivist method of study, it, therefore, follows the concept of social constructivism" (p. 1150). Since the students reflected on collaboration during discussed the topics with a group, Alquasham and Al-Ahdal (2021) claimed that "students' relationships with their communities culminated in a variety of meanings that were resolved by relational mediation, resulting in group harmony and shared understanding" (pp. 1150-1151).

Second, the results from the questionnaire revealed Thai EFL students' positive attitudes toward the *'strategy use'* of the mind map strategy that the use of mind map can be applied in daily life and can help mentally visualize the ideas that the students want to write. This finding is reliable to the findings reported by Pribadi and Susilana (2021), who indicated that using mind mapping as a learning approach "allows students to have a visual representation of their opinions and knowledge to be influential in implementing the basis of theoretical reviews of constructivist approach" (p. 915). As can be seen in the benefits of using mind maps, Nidayanti and colleagues (2021) recommended that the mind-mapping technique should be implemented to encourage students by using several media and pictures in writing pedagogy. This finding is also related to a study by Luangkrajang (2022), who used mind mapping in EFL classrooms and revealed that Thai EFL students had positive opinions toward the use of mind mapping. By integrating mind mapping techniques in English language classrooms, "students can transform textual descriptions into visual depiction, allowing visual learners to capture and understand the details of the lesson more easily" (Luangkrajang, 2022, p. 1620).

Third, regarding the *'ease'* of writing descriptive paragraphs, the results indicated that Thai EFL students reflected their positive attitude toward the easiness of writing in English when they engaged in writing descriptive paragraphs through the use of mind maps. Similarly, a study by Pribadi and Susilana (2021) also revealed that using a mind map learning strategy provides the students "easiness in choosing any correlated themes/ topics to breakdown" (p. 915). This finding is also related to a study by Sabarun and colleagues (2021), who conducted the steps to write an expository essay using a mind map, including writing an introduction, choosing a topic, using mind-mapping to select a topic, doing extensive research, integrating the research using mind-maps, deciding a structure, creating an outline of the essay using mind-mapping, making a mind map, crafting a thesis statement, starting drafting the essay, proof-reading and editing, and conclusion. Importantly, Sabarun and colleagues (2021) mentioned that in the step of choosing a topic, using mind-mapping can assist the writers in providing a writing topic that is well-known to the writers; thus, it is easy for the writer to write an expository essay. Consequently, using a flow mind map affected learners' writing exactness and learning motivation and contributed positive attitude in writing class (Sabarun et al., 2021).

Fourth, the present study confirmed the findings about the EFL learners' *'enjoyment'* attitudes towards the mind map on their L2 writing development. Thai EFL students reflected the positive attitude that they enjoyed while engaging in the use of the mind map strategy, particularly the positive affective of excitement during writing in English. In line with the findings from a previous study by Al-Zyoud and colleagues (2017), who established that mind mapping could facilitate students' writing skills, according to evidence that most students enjoyed using mind mapping as it contributed to developing their writing ability, as reflected in the post-test score. Similarly, a study by Wangmo (2018) also found that Thai EFL students mentioned that they enjoyed drawing and designing mind maps since it helped them to comprehend both what and how to write. Therefore, Wangmo (2018) emphasized that "the mind mapping technique had motivated students to perceive writing with positive attitude and enthusiasm, rather than dreading it as a complex task" (p. 77). Recently, Luangkrajang (2022) examined the use of mind mapping in language teaching and revealed the effectiveness of mind mapping in English classes. The researcher found that mind mapping can enhance students' positive affective domain and allow students to be active learners.

6. Conclusion

This study investigated the benefits of using a mind map to enhance the EFL students' L2 writing development in terms of facilitating L2 writing abilities, encouraging the learners' positive attitudes toward L2 writing, making L2 writing to be an easier task, and leading to enjoyment while applying mind maps. Engaging in mind map discussions with peers can facilitate EFL writers to develop their descriptive writing abilities. In addition, using mind maps with well-organized visual themes of writing promotes effective writing strategies for EFL students. Since most Thai EFL students have low English proficiency, understanding what they are going to write in English through visualization or images in mind maps may help them to encounter an early stage of L2 writing development. Moreover, applying mind maps with key themes, related images, and keywords of the given topics can lead to the easiness of descriptive paragraph writing. Lastly, learning to write an English descriptive paragraph through the use of mind maps is able to encourage EFL students' enjoyment during English writing activities that apply colorful images and well-organized mind maps.

In terms of cognitive processes of writing, mind maps encourage EFL writers' conceptualization, imagination, and analysis. Furthermore, mind maps also encourage EFL learners' attention, engagement, organization, comprehension, and concentration during the writing process. Obviously, mind maps can assist EFL students to organize ideas, create their texts during the pre-writing. Accordingly, mind maps appear to be a useful tool to support students in planning their writing since it encourages them to gain and create a deeper understanding of the writing topics. Therefore, mind mapping is also an effective instructional tool for descriptive paragraph writing, and it has a significant influence on the development of learners' critical thinking skills, notably in recovering their prior knowledge in order to make connections with the new information of L2 learning.

In conclusion, L2 writing development through the use of mind maps as a tool facilitates writing performance and positive attitudes towards the easiness and enjoyment of L2 writing. Through the eyes of this present research, EFL learners have a variety of prospects, and they reveal more self-confidence in English writing. Moreover, mind mapping also facilitates L2 writing abilities, such as organizing, sequencing, developing new ideas, and establishing the link between ideas in descriptive paragraph writing. Thus, this suggests the use of mind maps to enhance learners' L2 writing development and encourage their enjoyment during EFL writing activities.

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