

# Learning to Write Through Mind Mapping Techniques in an EFL Writing Classroom

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**Abstract**—The study aimed at exploring the links between using mind maps and L2 writing development during EFL students engaging in writing processes. Six EFL students in a northern province in Thailand were selected to participate using a purposive sampling method. The students were categorized into three groups depending on their English proficiency: advanced, intermediate, and beginner EFL students. The mixed-method research design was employed to collect quantitative and qualitative data using research instruments: pretest/posttest, participant observation, and semi-structured interviews. The finding revealed that the EFL students used mind-mapping and writing strategies to enhance their writing abilities by translating, memorizing, revising, and evaluating. In addition, mind-mapping strategies also encouraged the EFL students' English vocabulary skills, writing processes, and positive attitudes towards L2 writing. In conclusion, a mind map is used as a cognitive strategy to assist EFL students in learning to write English.

**Index Terms**—mind map, EFL students, writing strategies, writing process

## I. INTRODUCTION

It is widely accepted that writing is viewed as a complex cognitive process (De La Paz & McCutchen, 2017). In learning to write, writers must use complex writing skills, including “grammatical devices, writing mechanics, sentence structures, and rhetorical devices” (Reya et al., 2021, p. 146). Importantly, engaging in writing tasks “enable writers to communicate their ideas effectively and perform well in academic settings” (De La Paz, 2017, p. 33). To develop writing skills, there is an increasing need for writers to compose effective written texts in the academic context (Hermillinda & Aziz, 2018). Therefore, it is crucial to give writing instruction a high priority in the classroom so that students develop a genuine interest in writing.

Problematically, learning to write English as a foreign language (EFL) is more complex than writing in a first language. Writers struggle with difficult writing tasks since they have to overcome complex processes of generating ideas, organizing ideas, and translating ideas into effective written texts (Nodoushan & Maibodi, 2017). According to Graham (2018b), mastering the craft of writing requires a substantial amount of time and effort in the classroom. To write effectively, writers should acquire writing skills to “understand the relevant knowledge related to the topic chosen, select word choices, use transition signals appropriately, and develop paragraphs into a good essay and so on” (Raya et al., 2021, p. 146). As a result of the complex writing processes, many students view writing activities as “boring, drains energy and thoughts, and takes up time” (Agustina, 2020, p. 34).

### A. Writing Difficulties in an EFL Context

In the EFL context, writing is difficult and challenging for teachers and students. In writing classrooms, the amount of time allocated to teaching writing at the secondary level was severely constrained; the average instructor devoted significantly less than one hour per day to teaching writing (Drew et al., 2017). In secondary schools, students are not given a specific writing instruction model, and by the time they enter college, they need help with writing (Srour et al., 2021). Regarding the Thai EFL context, students cannot be freely exposed to English; therefore, they must intentionally study the language and monitor their English use (Kaewnuch, 2019). However, Thai EFL learners are struggling to master effective writing skills because of their grammatical problems (Chairinkam & Yawiloeng, 2021). These complex problems of EFL writing are the fact that Thai EFL students have few opportunities to write English in classrooms and in their daily life. These students are taught to fill in English words in the blanks of given sentences and correct verb tenses in appropriate grammar. Thus, these constraints cause the problems of EFL writing pedagogy which are difficult to handle.

### B. Significant Roles of Mind Maps L2 Writing Abilities

To overcome writing problems, a mind mapping technique is proposed to solve the problems of EFL writing. There has been growing interest in mind maps as a thinking tool to enhance second language writing abilities (e.g. Agustina,

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2020; Pribadi & Susilana, 2020; Vejayan & Yunus, 2022). To improve students' writing performance, mind maps are seen as a superior technique for enhancing students' "producing a skilled and organized thought process which later transferred into a written text" (Vejayan & Yunus, 2022, p. 2738). In writing classrooms, mind map plays a role as a visualization tool to enhance students' logical thinking ability and cognitive scheme development (Vejayan & Yunus, 2022). Raya et al. (2021) used a mind map to promote writing accuracy and highlighted that a mind map activates more brain functions to organize learning, create brief and interesting notes, and introduce words related to the topic. In addition, the mind mapping approach is used to help students write assignments to create fresh ideas for writing, explore coherent topics, write clear themes, integrate concepts, and gain knowledge of writing topics (Pribadi & Susilana, 2020). To write procedure text, mind mapping techniques can help students to express ideas and develop their reasoning in writing procedure texts (Agustina, 2020). Additionally, Shakoori et al. (2017) found that the writing performance of EFL students can be improved by adopting mind mapping as a pre-writing approach. Besides, writing needs the development of specialized knowledge and relies on knowledge gained through language acquisition (Graham, 2018a). Additionally, Sebit and Yıldız (2020) revealed that learners had positive experiences using computerized mind mapping as a pre-writing activity in the EFL context, and their attitudes towards writing were quite positive.

## II. LITERATURE REVIEW

### A. Cognitive Mechanisms in L2 Writing

Writing is influenced by cognitive and linguistic resources and writing processes (Kim et al., 2021). According to Hofmann and Asmundson (2017), the cognitive theory proposes that a vast cognitive system exists in a taxonomic structure, ranging from surface-level thoughts (products) to mechanisms that operate on information (processes) and deep structures (schemas). Among the tools identified, cognitive control has been proposed as essential for proficient bilingual language processing and use (Luque & Morgan-Short, 2021). Additionally, a cognitive process that includes both word spelling and decoding can temporarily store and change information for short periods as part of continuous cognitive operations (Mlakar, 2022). Révész et al. (2017) showed that integrated tasks could reduce planning time due to their content support and let writers focus on other tasks, like overall revision and monitoring. According to research on the L2 writing process in assessment contexts, assessment conditions influence time allocation, pausing, planning, monitoring, fluency, revision patterns, and perception of difficulty level are all examples of writing behaviors and cognitive mechanisms (Davoodifard, 2022). Besides, Luque and Morgan-Short (2021) indicated a significant relationship between cognitive control abilities, specific to reactive control, and overall L2 proficiency. Michel et al. (2020) found that students relied heavily on translation for both tasks; however, because they could not access the source materials, they spent more time planning for the independent task. A better understanding of the relationships between cognitive and linguistic resources, online writing processes, and writing products would yield a more robust understanding of L2 writing (Kim et al., 2021). In conclusion, writing connects with complex cognitive processes, which are helpful for planning strategies and L2 writing development.

### B. Mind Maps

Mind maps are viewed as a helpful tool for second language learning. Grant and Archer (2019) established that a mind map could support professional growth and identification in any field of study in a scaffold, collaborative, and creative way. Sebit and Yıldız (2020) supported that many students viewed mind mapping was necessary, especially for organizing and searching for information as a pre-writing activity. Participants in the individual mapping condition improved significantly in content and organization to a no-mapping condition in all essay tasks (Sebit & Yıldız, 2020). Furthermore, a mind map is a visual thinking tool with many advantages compared to top-down note-taking and writing, making it hard for writers to link ideas (Pham, 2021). Like, Elhawwa (2022) found that 50% of computer science majors agree that mind mapping can help them find ideas before they write, start a descriptive piece in an orderly way, write sentences quickly using the words in the branches, remember things better, organize information, make a complicated idea easier to understand, have more relevant details and be better organized and connected, and improve their performance as they become more efficient. As a result, using the mind map considerably benefits teaching writing in a second language.

### C. Previous Studies of Using Mind Maps in EFL Writing Classrooms

Previous studies have emphasized the significant role of mind mapping techniques in enhancing L2 writing performance. Nodoushan and Maibodi (2017) examined the effectiveness of the mind mapping strategy on EFL learners' writing ability. The quantitative results of the study confirmed that a mapping strategy is an effective tool for facilitating English vocabulary used by Iranian EFL writers. In terms of EFL writing context, this previous study revealed that utilizing mind mapping strategy positively affected EFL learners in developing topic understanding, well-organized, and classified main ideas (Nodoushan & Maibodi, 2017). In addition, to create mind maps during the planning stage, the mind mapping strategy assisted the EFL students in selecting various and appropriate vocabulary for writing. Thus, the researchers provided significant pedagogical implications that "the use of aspects in mind mapping such as key pictures, keywords, colours, word categorization, etc. can make the presentation of vocabulary items easier" (Nodoushan & Maibodi, 2017, p. 15).

Later, mind mapping techniques were used to promote writing skills for EFL Indonesian students. Agustina (2020) conducted a quasi-experimental research and used mind mapping techniques to teach writing procedure text. Agustina (2020) mentioned that mind mapping techniques could improve the students' imagination and concentration during writing procedure texts. The researcher confirmed the four advantages of mind mapping techniques in improving writing skills, including memorizing a thing easily, concentrating on their ideas, improving understanding, and encouraging positive attitudes (Agustina, 2020). In brief, the researcher suggested that mind mapping strategies can be deployed as appropriate learning techniques for procedural writing skills.

In a primary school context, mind mapping is used as a practical teaching approach to enhance students' writing modularly. Pribadi and Susilana (2020) conducted mixed-method research to investigate the effects of mind mapping in writing modular learning materials. The study's findings uncovered that the mind mapping approach could help students acquire retrieval knowledge through mind mapping, storing knowledge in memories, and applying their techniques to gain new information knowledge (Pribadi & Susilana, 2020). The findings from the qualitative data also revealed that the mind mapping approach facilitates the students to generate ideas and connect ideas from prior knowledge to present knowledge of writing assignments.

Recently, a flow mind map was used to enhance writing accuracy and learning motivation in an EFL higher education context. Raya et al. (2021) conducted a quasi-experiment design and used flow mind maps in the prewriting steps by allowing students to create a writing plan in a mind map. The results showed that the students who used the flow mind map during the pre-writing stage could perform better on writing accuracy and learning motivation. Based on the positive findings, Raya et al. (2021) suggested incorporating the flow mind map as an alternative teaching and learning technique to arouse teacher and learner motivation.

Regarding a mind map's effectiveness in EFL writing, teachers have been driven and encouraged to continually seek new approaches or strategies that fit their EFL pedagogical method. As a result, a mind map can enhance the teaching and learning process and provide a clear illustration of how to facilitate, control, and monitor students' writing activity. However, current research has been focused on using mind mapping to enhance L2 writing abilities; rather, less attention has been paid to using mind mapping techniques to enhance EFL students' descriptive paragraph writing. Previous studies have only revealed the benefits of mind mapping in L2 writing development. However, it remains unclear whether mind maps and writing strategies could help EFL students learn to write in each writing stage. Therefore, this paper investigates the effects of the mind mapping technique in promoting writing strategies during pre-writing, while-writing, and post-writing stages of descriptive paragraph writing.

### III. METHOD

#### A. Research Design

This study was conducted using a mixed-method design. It was carried out over eight weeks in an English classroom. The first session was a pretest, the following eight sessions comprised descriptive paragraph writing activities, and the final session was a posttest and semi-structured interview. The semi-structured interview consists of four sessions to answer in-depth answers from the participants regarding the connections between utilizing mind maps and developing writing skills in a second language during EFL students engaging in writing processes. Firstly, the researcher used ice-breaking questions before the interview to reduce the participants' anxiety. Secondly, the researcher produced prior knowledge of learning and writing in English. Thirdly, the researcher asked three questions. Finally, the interview data were transcribed verbatim, coded, and categorized following the research objectives. In this study, semi-structured interviews were conducted on a focus group of six different proficiency EFL students after the last period of writing activities. First, the participants were asked to sign a consent form to grant permission for the interview, audio-recording of the interview, and subsequent use of the data. To encourage participants to provide truthful answers, confidentiality was assured. Data were kept confidential, and only the researcher had access to them. As a result, data were treated confidentially at all stages of the process, and participants' anonymity was maintained.

#### B. Participants

The participants of this study included 30 EFL secondary students (8 males and 22 females, 17-18 years old) studying at a school in the north of Thailand. The participants were chosen using a purposive sampling technique. Their pretest scores from a writing test included beginner, intermediate, and advanced levels. The participants enrolled in the English subject as a fundamental English course. These EFL students studied in a Talented Science-Math (TSM) classroom.

#### C. Data Collection and Data Analysis

To collect data, semi-structured interviews were employed to collect qualitative data. After the last session of the writing exercises, a semi-structured interview was done with a focus group of six different proficiency EFL students. In addition, the semi-structured interview questions included three questions adapted by the researcher from a prior study by Kamli (2019). The interview questions included: 'What are your English writing challenges?', 'What are your solutions?', 'How do you solve these issues during pre-writing?', 'How do you solve these authoring issues?', 'How do

you solve these issues post-writing?" and 'Does a mind map aid English writing?' The researcher interviewed participants in Thai (L1) to ensure in-depth data since the data collection took place in an EFL context, where EFL students had trouble speaking English, which made interviews challenging. In this research, the researcher did not receive direct, straightforward responses to research questions; but rather indirect and, at times, ambiguous or biased data that must be carefully analyzed (Soroko & Dolczewski, 2020). Before collecting the data, the ethics approvals of this study were granted by the University of Phayao, Thailand (UP-HEC 2.2/022/65). The qualitative data from the semi-structured interview were analyzed using the content analysis method.

#### IV. RESULT

To answer the research question, "What are the links between using a mind map and L2 writing development while EFL students are engaging in writing processes?", the semi-structured interview was conducted to collect data from six EFL students who were beginner, intermediate, and advanced EFL learners. The qualitative data from the content analysis are as follows.

##### A. The EFL Students' Writing Difficulties

Table 1 reveals the qualitative results from the semi-structured interview; the question was "What problems do you confront with writing in English?" Six EFL students, including two advanced EFL students, two intermediate EFL students, and two beginner EFL students, were interviewed after they engaged in English writing activities, developing their writing skills through the utilization of mind maps.

TABLE 1  
EFL STUDENTS' DIFFICULTIES IN ENGLISH PARAGRAPH WRITING

Participants	Statements	Coding	Writing difficulties
Advanced EFL learners	• "I generally wrote words and utilized the Google Translate application to aid, so I had no issues with grammar."	A1	• Not mention
	• "It is difficult for me to organize sentences in a paragraph."	A2	• Organization
Intermediate EFL learners	• "I always use incorrect vowels when writing words."	I1	• Writing mechanic
	• "Some words are hard for me to spell, but using grammar in a sentence is harder."	I2	• Writing mechanic
Beginner EFL learners	• "I frequently choose vocabulary inappropriately."	B1	• Vocabulary
	• "The sentences are difficult for me to construct correctly."	B2	• Organization

Table 1 shows that Thai EFL students struggled with English paragraph writing difficulties regarding the mechanics of spelling words, organization, and vocabulary. As can be seen, the advanced EFL learners faced organizational problems while attempting to organize sentences (Student A2) in English. However, the intermediate EFL learners coped with difficulties in mechanic issues of spelling errors and English grammar (Student I1 and I2). Lastly, beginner EFL learners also faced vocabulary and organization difficulties while writing English paragraphs. In brief, difficulties in choosing inappropriate English vocabulary, spelling and grammatical errors, and organizing sentences were obstacles for Thai EFL learners in writing paragraphs in English.

##### B. The EFL Students' Writing Strategies During the Pre-Writing Stage

To discover the EFL students' writing strategies while they engage in pre-writing activities through mind mapping, they were asked, "What strategies do you use to overcome these problems?" In the pre-writing activities, the EFL students were instructed to plan a paragraph with their peers. In addition, mind mapping was utilized as a writing model to assist students with idea generation, organization, and goal setting.

TABLE 2  
EFL STUDENT'S WRITING STRATEGIES DURING THE PRE-WRITING STAGE

Participants	Statements	Coding	Writing strategies during pre-writing process
Advanced EFL learners	• "I frequently look at words and learn them that are simpler to be familiar with and remember, and I utilize Google Translate to aid with words I am unsure."	A1	• Memorizing • Translating
	• "I used a translation app and asked friends for assistance."	A2	• Translating • Asking peers
Intermediate EFL learners	• "Retrieve vocabulary knowledge first and remember to write it down."	I1	• Memorizing
	• "I always read words and memorize them."	I2	• Memorizing
Beginner EFL learners	• "Verify the spelling taken from Google Translate."	B1	• Translating
	• "The first round involves typing and writing directly in Thai using Google Translate, and then check the English sentence using Google Translate once more."	B2	• Translating

According to Table 2, the EFL students reported writing strategies they used during the pre-writing stage by translating, memorizing, and asking peers. To plan paragraph writing, the advanced EFL learners prepared their vocabulary knowledge by translating unfamiliar words, memorizing words, and asking peers for assistance (Students A1 and A2). Regarding the intermediate EFL learners, they focused on knowledge of vocabulary using memorizing

strategy (Students I1 and I2). Regarding beginner EFL learners, they translated words from Thai (L1) to English (L2) using the Google Translate website.

During the while-writing stage (Table 3), the EFL students were instructed to write a paragraph utilizing the mind map they had created. These students were interviewed to reflect on their writing process and strategies to enhance their writing abilities at this stage.

TABLE 3  
EFL STUDENTS' WRITING STRATEGIES DURING THE WHILE-WRITING

Participants	Statements	Coding	Writing strategies during while-writing process
Advanced EFL learners	• "Search for any unavailable words and the writing recalled a memory."	A1	• Searching words
	• "Use a translation app to check words."	A2	• Translating words
Intermediate EFL learners	• "Select examples from the Internet and other media sources. In addition, friends provide support and advice."	I1	• Searching words • Writing with peers
	• "I consult with and request my teacher and friends to edit my writing."	I2	• Asking the teacher and peers
Beginner EFL learners	• "Search for words using Thai and some English. Since the responsibilities have been divided, I enjoy collaborating with my friends in groups."	B1	• Searching words • Writing with peers
	• "Examine and compare online examples of sentence construction."	B2	• Constructing sentences

According to Table 3, the EFL students reported that they used writing strategies to search for English words, write together with peers, translate words, and construct sentences. The advanced EFL learners searched for English words (A1) and translated them (A2) while composing paragraph writing in English. Regarding the intermediate EFL learners, they reported that the writing strategies used while paragraph writing namely searching for words from the Internet (I1), writing with their peers (I1), and asking the teacher and peers while editing the paragraph (I2). Lastly, the beginner EFL learners searched for words, wrote together with peers (B1), and constructed sentences (B2). In sum, writing strategies used in the while-writing stage included searching for words, translating the words, and writing with peers.

During the post-writing stage (Table 4), the EFL students were instructed to review and evaluate their paragraph writing with their peers. The students were asked to revise the written paragraph individually at the final stage. After participating in the writing stage, the students were interviewed about their writing strategies in the post-writing stage.

TABLE 4  
EFL STUDENTS' WRITING STRATEGIES DURING THE POST-WRITING STAGE

Participants	Statements	Coding	Writing strategies during post-writing process
Advanced EFL learners	• "I double-checked the writing and the wording on the self-evaluation form provided by the teacher."	A1	• Revising • Self-evaluating
	• "It is easy for me to edit writing individually following the self-evaluation checklist."	A2	• Editing • Self-evaluating
Intermediate EFL learners	• "Review and verify the words once again."	I1	• Revising
	• "Reread the first sentence to the end."	I2	• Revising
Beginner EFL learners	• "I like to evaluate my writing with my peer."	B1	• Self-evaluating
	• "I compare the appropriate sentences from friends and the internet and examine the sentence in English class with the teacher's assistance."	B2	• Revising with the teacher and peers

According to Table 4, the EFL students deployed writing strategies to review their paragraph writing during the post-writing stage by revising, self-evaluation and editing, respectively. The advanced EFL learners stated that they engaged in self-evaluating (A1 and A2), revising (A1), and editing (A2) their paragraph writing at the final stage. For the intermediate EFL learners, they encountered the revising (I1 and I2) stage to achieve their writing. Regarding beginner EFL learners, they conducted self-evaluating (B1) and revising (B2) with the teacher and peers. In short, these EFL learners preferred to use the revising stage before completing their paragraph writing.

### C. Using Mind Maps to Facilitate L2 Vocabulary Skills

To answer research question number two, "What are the links between using a mind map and L2 writing development during the EFL students engage in writing processes?" The students were interviewed with "How a mind map helps you to write a paragraph in English? The qualitative data from the semi-structured interviews were transcribed and analyzed in terms of the advantages of mind maps in facilitating vocabulary skills, writing processes, and positive attitudes.

#### (a). Using Mind Maps to Facilitate Vocabulary Skills

The EFL students shared their perceptions towards the advantages of mind mapping in facilitating their vocabulary skills. While participating in writing activities, these Thai EFL students were asked to create their mind maps to enhance their thinking processes in planning the topics, subtopics, keywords or necessary vocabulary to support main ideas. In the semi-structured interviews, the students reflected on their use of mind mapping to promote their vocabulary skills as the excerpts from Students B1, B2, I1, A1, and A2.

EXCERPT 1	
Participants	Statements
Advanced EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps helped me to understand unfamiliar words easily.” (Student A1)</li> <li>• “Mind maps helped me remember vocabulary I have to write in a paragraph.” (Student A2)</li> </ul>
Intermediate EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps helped me to understand English vocabulary and memorize them.” In addition, “mind maps also motivated to group vocabulary for writing.” (Student I1)</li> </ul>
Beginner EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps helped me to organize vocabulary according to subtopics.” (Students B1 and B2)</li> </ul>

Excerpt 1 above shows that using mind maps can enhance the EFL students' vocabulary skills regarding understanding unfamiliar L2 vocabulary, memorizing words before writing, and grouping vocabulary to organize paragraph writing.

*(b). Using Mind Maps to Facilitate Writing Processes*

The EFL students informed that they used mind-mapping techniques to cope with paragraph writing. During the pre-writing stage, mind mapping was used to brainstorm, generate, and translate ideas into descriptive paragraphs. These students stated that:

EXCERPT 2	
Participants	Statements
Beginner EFL learners	<ul style="list-style-type: none"> <li>• “Using mind maps helped me to write sentences quickly, write a paragraph concisely, and understand easily.” (Student B1)</li> <li>• “Using mind maps helped me to write English sentences and paragraphs quickly.” (Student B2)</li> </ul>

Excerpt 2 above revealed that beginner EFL students indicated that using mind maps during the pre-writing stage can assist them in writing English sentences and paragraphs quickly, concisely, and efficiently.

EXCERPT 3	
Participants	Statements
Intermediate EFL learners	<ul style="list-style-type: none"> <li>• “Using mind maps helped me to organize the contents of each paragraph appropriately. Topics and subtopics in mind maps can reduce the difficulties of paragraph writing. I can write many subtopics.” (Student I1)</li> <li>• “Using mind maps helped me transform ideas into mind maps. In addition, using mind maps can help me summarize information, generate ideas, and write an English paragraph easily. I can organize my ideas, take notes creatively, and enhance my critical thinking. Using mind maps helped me to recall my prior knowledge of the topic, group ideas, and sequence the contents logically. I can transform my ideas into a paper, draw and link my ideas into mind maps.” (Student I2)</li> </ul>

According to Excerpt 3 above, the intermediate EFL students reflected in the interview that mind mappings assisted them in generating, organizing, summarizing, and transforming ideas from mind maps into paragraph writing. In addition, these EFL students indicated that using mind maps can reduce English writing difficulties by recalling prior knowledge of topics and sequencing the contents for writing through maps.

EXCERPT 4	
Participants	Statements
Advanced EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps helped me write creatively and understandably. Mind maps helped me to think systematically, write effectively, and understandably.” (Student A1)</li> <li>• “Using mind maps helped to recall stories of the given topic, and I can organize the contents easily. Moreover, writing by using mind maps can enhance various ideas of contents, write paragraphs coherently and easily and understand easily. The mind maps helped me to write a paragraph coherently.” (Student A2)</li> </ul>

Excerpt 4 above uncovered that advanced EFL students stated that mind maps could enhance them to think creatively and systematically. Mind maps were used; for example, mind maps enhance abilities to recall prior knowledge, organize ideas and contents, and write English paragraphs easily and coherently.

*(c). Using Mind Maps to Promote Positive Affects*

During the writing process, the EFL students had opportunities to create mind maps as a cognitive tool that can enhance their abilities to write in English. For example, the components of a mind map, including lines, images, codes, and colors can promote students' interests and have positive perceptions, as shown in the excerpts below.

EXCERPT 5	
Participants	Statements
Advanced EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps led to motivation in paragraph writing.” (Student A1)</li> </ul>
Intermediate EFL learners	<ul style="list-style-type: none"> <li>• “Mind maps motivated me to group vocabulary into each subcategory for writing.” (Student I1)</li> </ul>
Beginner EFL learners	<ul style="list-style-type: none"> <li>• “Images and colors in mind maps motivated me in learning to write. Mind Maps can increase enthusiasm in English paragraph writing.” (Student B1)</li> <li>• “Mind maps motivated me to write, and I want to continue learning.” (Student B2)</li> </ul>

According to Excerpt 5, the EFL students agreed that using mind mapping during paragraph writing activities was beneficial. Mind maps can motivate students to write in English and increase their enthusiasm for learning to write.

#### *D. The EFL Students' Writing Strategies During the Writing Processes*

The findings confirmed that the EFL students mostly preferred translating and memorizing during the pre-writing processes, searching for words during the while-writing stage with peers, and self-evaluating during the post-writing stage. The main findings of this current study confirm the findings of Chairinkam and Yawiloeng (2021) which revealed that learning to write with peers and engaging in problem-solving activities with peers could enhance learners' abilities to gain knowledge and understanding during writing processes. The researchers highlighted that learning to write through peer scaffolding and interaction with peers "can improve the level of learners writing ability since they can utilize scaffolded assistance while working together and then reach a level of performance beyond their level as well" (Chairinkam & Yawiloeng, 2021, p. 233).

Regarding *memorizing strategy*, the EFL students used this writing strategy to retrieve vocabulary knowledge from their memory at the pre-writing stage. According to Flower and Hayes (1981), relevant information from long-term memory "is so well developed and organized in memory that the writer is essentially generating standard written English" (p. 372). During the writing process, writers' knowledge develops because "the structure of knowledge for some topic becomes more conscious and assertive as we keep tapping memory for related ideas. That structure, or "schema," may even grow and change as a result of library research or the addition of our own fresh inferences" (Flower & Hayes, 1981, p. 381). Thus, planning to write using prior knowledge and related information from memorization can lead writers to the text-generation stage for "turning ideas into words, sentences, and larger units of discourse within working memory" (De La Paz & McCutchen, 2022, p. 40).

Regarding *translation strategy*, the findings showed that the advanced EFL students translated their ideas from Thai (L1) to English (L2) using Google Translate. This evidence of translating writing strategies to translate ideas for writing from the first language to the second language is in accordance with a statement by Sasaki et al. (2018) who viewed L1-to-L2 translation as "translating or attempting to translate the idea generated into the L2" (p. 294). According to De La Paz and McCutchen (2017), translating ideas into written text involves transcription and text generation. These two components could enhance writing outcomes in terms of language generation such as "more accurate spelling, more precise word choice, and more varied or sophisticated syntactic structures" (De La Paz & McCutchen, 2017, p. 39).

In terms of *revising strategy*, the finding uncovered that the EFL students revised their paragraph writing at the post-writing stage to recheck their vocabulary, sentences and language use in their final written products. This finding supports a statement of Hermillinda and Aziz (2018) that the revising strategy allows EFL students to participate in "rereading the text they have produced and making changes in the plan and ideas, and searching for errors in punctuation, spelling and grammar" (p. 1829). Significantly, in the revising stage, writers have to ensure that the written text matches their writing plan by "reconsidering the argument, reviewing the evidence, refining the purpose, reorganizing the presentation, and reviving stale prose (Hermillinda & Aziz, 2016, p. 175). Consequently, focusing on revising stage was likely to focus on higher-level features of text and improve their writing quality (De La Paz & McCutchen, 2017). This evidence of revising strategy also supports the view of De La Paz and McCutchen (2017) that low-achieving writers achieved independence in revising after learning a meta-cognitive strategy.

For *self-evaluating strategy*, the finding revealed that the EFL students evaluated their English paragraph writing by the self during the post-writing stage. Evaluating strategy is identified as a cognitive strategy that writers reconsider written text and goals (Mu, 2005; as cited in Hermillinda & Aziz, 2018, p. 1823). Self-evaluating or self-assessment is viewed as a self-regulation and high-level skill involving a high cognitive demand that allows the writer to actively direct and control the composition process (Castello et al., 2010, p. 1263). This self-evaluating strategy finding is consistent with Moqbali et al. (2020) who revealed that all the students viewed self-evaluation as a strategy to evaluate, check their writing clarity and check ideas to clarify the topic (p. 225). From the results, the researchers suggested that "providing students with guidelines to check their performance in the form of a checklist can be a very effective technique by which students can highlight the aspects they need to evaluate in their writing" (Moqbali et al., 2020, p. 228).

#### *E. Using Mind Maps to Facilitate L2 Writing Abilities*

According to the findings of this study, EFL students used mind mapping as a writing strategy to facilitate English vocabulary skills, writing processes, and positive attitudes towards descriptive paragraph writing. First, the evidence of using mind maps to promote vocabulary skills is similar to a study by Nodoushan and Maibodi (2017), who found that using the mind map strategy can enhance the vocabulary learning and writing ability of Iranian EFL learners. In the study, the researchers used the mind-mapping technique to explain vocabulary learning and allowed the students to create mind maps by drawing mind maps together with new words they had learnt. Nodoushan and Maibodi (2017) claimed that using mind maps as a bridging medium can assist Iranian EFL learners in presenting vocabulary easier and memorizing vocabulary items quickly. Thus, the researchers highlighted the predominant results that "mind maps help in better vocabulary learning and retention" (Nodoushan & Maibodi, 2017, p. 15). Similarly, Arulselvi (2017) also mentioned that keywords in mind maps would trigger as much relevant meaning as possible. Importantly, Arulselvi (2017) stated that "by using keywords in a Mind Map, one opens up his or her thinking and stimulates the mind to dig

deeper and see greater detail on thoughts that were previously vague... It's also far easier to remember single words and striking headlines than to remember long sentences" (p. 59).

Second, the findings of this current study also revealed that the mind-mapping technique could enhance L2 writing performance and cognitive writing processes. According to the findings of this current study, mind-mapping techniques can enhance Thai EFL students to write English easily, quickly, concisely, and creatively. In addition, mind maps can promote Thai EFL students' cognitive processes while writing by recalling prior knowledge, generating, and organizing ideas from the mind-mapping technique to transfer these ideas to write their descriptive paragraphs. These findings support the results of the previous study, such as Vejayan and Yunas (2022), which revealed that using digital mind mapping can enhance ESL beginner writers' performance writing. The researchers claimed that the mind mapping technique is vital in promoting ESL writers in organizing ideas, generating ideas quickly, preparing ideas for writing quickly and easily, and composing narrative writing with clarity and precision. In addition, this finding is consistent with the results of Pribadi and Sasilana (2020) which confirmed that mind mapping could help students to retrieve gained knowledge and link new information to complete their writing. The study revealed that the mind mapping technique could also assist students in generating topics and connecting ideas. The researchers confirmed that "mind mapping triggers the creativity to connect each sub-topic in the students writing outline... and makes the ideas flooding out when start writing" (Pribadi & Sasilana, 2020, p. 915).

Third, the findings uncovered that mind maps could facilitate the EFL learners' positive attitudes such as motivation and enthusiasm. Thai EFL learners revealed that mind-mapping techniques could motivate them to group vocabulary and ideas, learn English writing, and increase their enthusiasm for writing. This finding supports the results of Vejayan and Yunus (2022), who uncovered that digital mind-mapping applications could enhance learners' affective aspects of feeling happy and motivated when they use the mind-mapping technique to guide their writing and facilitate their ideas for writing. The finding also supports the results of Raya et al. (2021), which showed that using a flow mind map can enhance L2 learners' writing accuracy and learning motivation. Finally, the researchers clarified that "by demonstrating to them the way to write an essay using a flow mind map, [learners] could easily connect their experiences to their writing form" (Raya et al., 2021, p. 158). In addition, a study by Khudhair (2016) also found that applying the mind-mapping technique in EFL writing classrooms can motivate students to learn and use new words regularly.

## V. CONCLUSION

This study investigated the effect of mind-mapping strategies on Thai EFL students' English paragraph writing. The main findings revealed that the EFL learners used mind-mapping techniques and writing strategies, namely memorizing, translating, revising, and self-evaluating. To complete their English paragraph writing, Thai EFL students memorized unfamiliar keywords to generate ideas in their mind maps, translated their ideas into English, revised the written paragraph according to their writing plan in the mind map, and evaluated their final product of paragraph writing by the self. The qualitative results from the semi-structure interviews also uncovered that Thai EFL students used mind maps as a thinking tool to enhance vocabulary skills, L2 writing abilities to write English effectively, recall prior knowledge related to the topic, generate and organize ideas for paragraph writing, and transfer the ideas from mind-mapping into the descriptive paragraphs. The findings of this study highlighted that using mind-mapping techniques can enhance Thai EFL students' positive attitudes, including motivation and enthusiasm for learning to write in English.

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