THE EFFECTS OF USING MIND MAPS TO ENHANCE EFL LEARNERS' L2 WRITING DEVELOPMENT

SAOWALAK TARIN

A Dissertation Submitted to University of Phayao

in Partial Fulfillment of the Requirements

for the Doctor of Philosophy Degree in English

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Approved in partial fulfillment of the requriements for the

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University of Phayao

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ABSTRACT

The purposes of the present study were 1) to investigate the effects of using a mind map on EFL students' L2 writing development and 2) to explore students' perceptions of the relation between using a mind map and L2 writing development while EFL students are engaging in writing processes. Thirty EFL high school students who studied at Chiang Rai Provincial Administrative Organization School were selected by purposive sampling technique. Six EFL students were categorized into three groups depending on their English proficiency: advanced, intermediate, and beginner. The 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 research instruments. This study revealed two significant findings as follows. First, the student post-test scores increased after engaging in the use of mind maps during the L2 writing activities Second, the EFL students used mind-maps and writing strategies to enhance their writing abilities by translating, memorizing, revising, and evaluating. In addition, mind-map strategies also promoted the EFL students' English vocabulary skills, writing processes, and positive attitudes towards L2 writing. As a result, the significant findings of this study lead to educational suggestions to use a mind map as an important thinking tool and to assist EFL students in learning to write English.

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CHAPTER I

INTRODUCTION

Rationale and Background of the Study

English is one of the several international languages that are most widely spoken by the majority of people all over the world. Besides, English is also the most widely used business language, and in the international market, people are expected to be able to communicate with people from different nations. In addition, English is the language of most of the content produced on the internet, so it is the language of the digital age. Furthermore, according to the Education 4.0 initiative, learners ought to be able to face opportunities and challenges which accompany the necessary skills for the 21st century (Oliveira & Souza, 2022). Besides, in the teaching and learning process, communication skills can be integrated with integrated language skills through the student–centered learning approach (Pardede, 2020). As well, EFL learners frequently need English writing skills, which is a very important skill, as they will be required to complete some writing tasks while studying English. Moreover, in the process of writing, students often find it difficult to start writing, even though sometimes they also have several ideas in their mind, but they are difficult to express in written form. Therefore, effective teaching and learning strategies, are very meaningful in enhancing students' accomplishments in writing.

Importance of Writing Skills in an EFL Context

Writing in the EFL context is challenging for both teachers and students. In secondary writing classrooms, the time allocated to teaching writing was severely constrained, with the average teacher devoting significantly less than one hour per day to writing instruction (Drew et al., 2017). It has been observed that EFL students are exposed to English documents on a regular schedule. The written texts were discovered in magazines, newspapers, books, articles in newspapers and on the internet, and various other types of written texts. Those written texts contain a wealth of information for the students. Furthermore, English texts are broadly presented to students in high school

textbooks. These textbooks consist of data related to the topics being studied by the students. In order to access these textbooks, they must be proficient in English.

Writing is categorized into two varieties as being practical and creative. Practical writing refers to the sort of writing supposed to convey a particular, direct, and clear message to a specific audience (Praminatih et al., 2018). Apart from being an unstructured and random exercise, writing should be viewed as a scaffolding process that needs designing and categorizing. Zhao (2014) asserted that students can amuse themselves through creative writing, encourage inventive expression, investigate the processes and values of writing, boost creativity, think clearly, seek identity, as well as learning to read and write better.

In summary, writing is a crucial skill, and it is very important in many aspects of human life. Furthermore, it serves as a mechanism of communication between individuals and communities. According to Aslanoğlu (2021), writing is an important way for learners to express their thoughts. Moreover, it aids in the preservation of languages and the transmission of language knowledge from one generation to the next and from one culture to the next. Besides, writing is necessary for learning because it stimulates various skills, one of which is thinking. Additionally, writing is important in teaching because it assists teachers in carrying out various activities at different stages of instruction. As a result, the roles that writing plays in various aspects of human life, highlight its significance as a valuable skill that must be learned and practiced.

Importance of Teaching Thai Students EFL Writing at the High School Levels

According to Abhakorn (2019), the Thai education reform that has made improvements to the curriculum for English pedagogy in public schools, there currently needs to be more writing courses available. Additionally, students who have graduated from high school have almost definitely limited writing skills practices. Particularly, non–English major students take fewer English classes and practice less at the tertiary level (Seensangworn & Chaya, 2017). Thus, Thai students who do not have personal tutors or participate in additional courses outside the classroom gain less understanding of writing in English.

In the context of EFL, most Thai EFL teachers realize the importance of composing academic writing such as for writing research papers, emails, memos, letters and academic reports. As in the finding of Noom-Ura (2013), the highest ranking of problems was concerned with teaching writing. To clearly illustrate, according to the curriculum of Chiang Rai Provincial Administrative Organization School, students have to pass English writing courses. However, high school students' writing ability still appears to be deficient. Furthermore, in aiming to assist Thai EFL learners in improving their writing skills, they need to afford a great deal of their time and energy to practice observing writing, making them feel depressed and eventually giving up on English writing accomplishment. Meanwhile, EFL writing teachers usually suffer from too much workload at school as they have to read and correct students' assignments, paragraphs, and essays created by less successful EFL writers. Therefore, this is accordingly understood to be a real obstacle that teachers require effective solutions.

The Problems of Writing Pedagogies in EFL Contexts

The main issue in Thai EFL students' English writing may be a negative transfer from the first language (Thai) into English (L2). Additionally, Kaweera (2013) mentioned that when writing in English, Thai students used translation strategies to translate their thought into Thai and then write the same in English. Consequently, it has been discovered that Thai EFL students are less successful in writing short paragraphs with correct grammar, although they have studied English for many years.

Furthermore, many errors are clearly visible as one of the expected elements of EFL writing, which has several effects on EFL writers when writing in English. One of these is the result of the Thai EFL writers' L1, which causes an interlingual error. On the other hand, Kaweera (2013) claimed that the process of learning English also causes frequent errors or intralingual errors. This evidence reflected that L1 is not the only major cause of language error. Specifically, errors assist as a source of reaction for writing teachers, representing the effectiveness of the pedagogical methodology (Kaweera, 2013). Moreover, teachers can examine student errors to identify flaws that need to be

addressed further. Therefore, teachers should be able to recognize and identify errors not only from a linguistic standpoint but also from a psychological standpoint.

EFL learners suffer various challenges that English native speakers readily solve, and these issues have gone unrecognized because little research has brought these problematic issues to the attention focusing on Thai EFL learners. As a result, it was recently reported that Thai students' English skills were classified as 'very low proficiency', placing them 56th out of 72 countries (Education First, 2016). This evidence reaffirmed that most Thai EFL students' English skills are not in a state of rapid development, and thus their future may be bleak.

To overcome problems in writing, many researchers recognize the major causes of the problems and the difficulties of EFL writers. Moreover, students should comprehend that making mistakes is a normal part of learning a language and that mastering a language takes time, effort, and patience (Ferris, 2002). According to Kaweera (2013), while errors are frequently associated with insufficient pedagogy, it is widely acknowledged that they can be exploited by EFL teachers to progress their teaching tactics. That is, teachers are also more likely to instruct and assist their students in the correct methods to become more successful language learners when they use linked teaching strategies. As a result, EFL writing mistakes can be used as an indicator of how language is learned and of the ways or procedures that learners employ when learning a language.

Writing problems of EFL students in non-English dominant countries face many challenges, including developing students' linguistic and communicative competence. For example, Korean EFL students require lexical and syntactic knowledge of L2 in order to understand the model text and compose a summary since they gain few opportunities to summarize written texts in L2 in their academic contexts (Cho & Brutt-Griffler, 2015). In the Japanese EFL setting, lower-level Japanese EFL students struggle with the logical paragraph structure used in written English as well as the differences between Japanese and English rhetorical styles (Okada, 2018). Furthermore, Indonesian EFL students also had issues with their language, cognition, and psychology (Toba et al., 2019). Also, Taiwanese universities do not offer enough English classes, and EFL students do not have many

chances to improve their English writing (Kao & Reynolds, 2017). While writing instruction was not formally established in Korea till the late twentieth century, writing has become an academic 'issue' ever since the Ministry of Education permitted universities to organize writing tests as one of the acceptance criteria in 1986 (Kim, 2017). Therefore, it is necessary for researchers and EFL writing teachers to investigate how EFL learners can learn to write in English successfully.

Writing processes have always involved many difficulties, and significant efforts have been necessary in order for teachers to present all the information that is needed in a concise way for students. Furthermore, these writing difficulties also involve the fact that EFL students are less successful to write well–organized structures or reasonable ideas. Moreover, EFL students would do better with some writing instructions and being provided with extra written work. However, teaching and learning time is devoted mostly to different skills including speaking, listening, reading, and writing. Thus, writing is regarded as a lower skill. To enhance writing skill, students must first be taught how to write. To assist students in overcoming their writing weaknesses, teachers should comprehend students' writing difficulties, recognize the value of writing techniques, and encourage students who struggle with writing in English. As a result, to solve writing problems as directly as possible, teachers should provide appropriate writing instructions and effective writing inventions for promoting EFL students learning to write English.

The Problems of Writing Strategies at Chiang Rai Provincial Administrative Organization School (CRPAOS)

Chiang Rai Provincial Administrative Organization School requires students to have English writing skills, such as filling out forms, taking messages, writing emails, and conducting business correspondence, which are all activities in which writing is primarily used in daily life. Additionally, some students participate in international settings, such as studying abroad to advance their education, where this English writing ability is crucial. Furthermore, for many CRPAO students, writing is the skill they find to be the most difficult because they have participated in an English language exchange program every year to work and share ideas with new friends. Moreover, the majority of students struggle with paragraph and essay writing in English. As a result, the English writing

problems of CRPAO students can be divided into four main problems: essay writing within the time limitations, writing English academic papers, using English grammar for writing, and appropriate writing organizations.

English is one of many subjects taught at CRPAO School. It is given to students from the first grade to the twelfth grade. By the statements made by the Ministry of Education (2008), the core curriculum of basic education is used in the teaching–learning process, and the teacher is responsible for providing students with teaching techniques for learning English, which is suitable for their needs. Obviously, English structure is one of the most challenging skills for students to acquire. Furthermore, when creating a piece of writing, students frequently encounter issues in using grammar and lexical elements (Boonyarattanasoontorn, 2017).

Regarding the English O–NET test results, the recorded average scores of students are still unsatisfactory from a broad perspective. Additionally, in the past three years, the average English O–NET scores of Thai students at the upper secondary school level (Matthayomsuksa 6) have been low (2018 to 2020) and are similar the Matthayomsuksa 6 students at Chiangrai Provincial Administrative Organization School.

However, Thai Matthayomsuksa 6 students' O–NET results (English subject) and Matthayomsuksa 6 students at CAPAOS from 2018 to 2020 (National Institute of Educational Testing Service, 2021) were lower than the nation's score. This problem is similar to the study of Lamla–Ong (2013), Thai EFL students had the most severe writing skill issues, according to a study of language learning issues at the university, and the writing task required students to use metacognitive strategies. As Anh (2019) mentioned, regular study and practice are necessary to develop writing skills, which are not acquired easily. That is, students must practice writing and reading a range of texts to improve their writing skills. Furthermore, students usually confront a variety of obstacles when it comes to establishing good writing skills. Regarding grammatical issues, writers have difficulties in learning and following English grammatical rules since verbs are frequently formed backward to ensure subject–verb agreement across tenses. Furthermore, EFL writers find it difficult to correctly employ articles, pronouns, prepositions, and connecting devices. Syntactically, EFL writers frequently find there are numerous types of sentence structures

in English syntax, making it difficult to use the proper structure, each with strict necessities for subordinate clauses and the use of conjunctions. To complete the task successfully, EFL writers need a wide enough vocabulary to apply it in a variety of contexts. However, they frequently struggle with selecting appropriate vocabulary in context. Moreover, writing necessitates students to organize and develop ideas logically, which presents a significant challenge to them.

In a case study of writing strategies, highly skilled writers were found to use both metacognitive and cognitive strategies (Seyyedrezaei & Maftoon, 2012). Furthermore, metacognitive strategies extend beyond the cognitive mechanism and enable students to manage their own learning through planning, monitoring, and evaluating (Ahmed, 2020). Additionally, teachers must invent effective strategies to stimulate students' interest in English as a second language learning, which is a difficult task for educators (Amjah, 2014). Moreover, writing instruction in schools is a complex interaction between teachers and external factors (Graham, 2019). Also, teaching students to use cognitive strategies is one way to help them develop their strategic thinking skills, which will eventually help them write more effectively (Graham, 2019). The best writing strategies must therefore be explicitly taught to students, as well as how to select the most suitable strategy.

To overcome these English writing difficulties, it is necessary to problem EFL students writing abilities by using effective writing strategies. Therefore, helpful and appropriate writing strategies are essential in assisting EFL students with assigned writing tasks and reducing writing problems. So, at CRPAO School, the researcher as a teacher proposed useful writing strategies and mind maps as writing interventions in the learning–teaching process to promote students' English writing development.

Writing Strategies Used by EFL Learners

According to Eliwarti and Maarof (2014), there are three widely used approaches to teaching writing: the process–based approach, the product–based approach, and the genre–based approach. Furthermore, synthesising these three approaches is known as the Process–Genre approach. Besides, Yan (2005) describes the Process–Genre approach's teaching technique as divided into six steps: 1) preparation, 2) modelling, 3) planning, 4)

joint constructing, 5) independent constructing, and (6) revising. Furthermore, Steele (2004) divided the Product Approach into four stages. Stage one (Familiarization) is the stage at which the focus is on the model texts and genre's features. Stage two (Controlled writing) entails controlled practice of the main features, typically in isolation. Stage three (Guided writing) is the most crucial stage in which the concepts are organized. Stage four (Free writing) is the final product of the learning process in which students select from various writing tasks to demonstrate their writing development. As Arici and Kaldirim (2015) mentioned, the process–based writing approach seeks to organize the writing process using constructivist teaching theory and the cognitive assistance of a teacher. Therefore, through the process approach of writing, learners' skills are enhanced by learning to write from both teachers and peers.

Proposed Solution: The Flower and Hayes' model in Enhancing Writing Ability

The Common Core State Standards (2010) specified that writing is regarded as a problematic cognitive process, and instruction aimed at modifying writers' ability to communicate and write effectively in educational settings on standardized tests is examined. Students in writing classrooms were confronted with how they generate their ideas in the process of writing. Rather than just the written product, a concentration on the writing process is now widely accepted in writing pedagogy. Moreover, learners' collaborative writing is emphasized in terms of designing, drafting, and editing strategies in classrooms ranging from elementary schools to universities.

Hayes and Flower (1980) defined writing as three main processes, namely planning, translating, and reviewing, which are made easier by both the writer's long–term memory and the external task environment. The process approach to writing was initially distinguished by focusing on personally significant writing contexts and the development of students' identities as writers. Currently, it has been used when students are asked to compose written texts to achieve learning objectives. During the writing process, students' thinking processes are scaffolded by teachers, thus enhancing and giving students more responsibility for the lessons' justification.

The primary goal of writing teaching is to assist students in developing the self-control necessary to successfully navigate the complexities of the writing process. In accordance with Hayes and Flower (1980, 1981), Flower (1984), and Hayes (1996), writing consists of three main cognitive processes: planning, translating, and reviewing. Moreover, Flower and Hayes highlight four elements in this theory: "Writers must think before writing, a higher-order organizational structure occurs during these procedures, composing involves setting objectives, and authors generate macro and micro objectives to complete the writing task." (Hayes & Flower, 1981, p. 366). In summary, this model is entirely focused on the mental writing process.

The Use of mind map Strategies in EFL Classroom

A mind map is the simplest method for increasing data in the human mind and extracting data from the brain. Furthermore, when a stratified order is followed, the fulfillment of this method that will increase creative thinking and make learning and note-taking easier is extremely simple (Şeyihoğlu & Kartal, 2010). Pradasari and Pratiwi (2018) point out that when ideas are unbroken from top to bottom, maps are easier to follow than long note-taking or listing techniques, and it becomes hard to form an association between the last and first ideas in the list. Besides, a mind map can be used as a tool to support students' design concepts during the pre-writing process, and they will be given examples of how to organize a step-holding device form in a grouping that will help them hold ideas until the entire essay is written. To the extent desired, using mind maps will also present data using pictures, symbols, keywords, codes, and color.

In the EFL classroom, a mind map assists teachers and students in enhancing thinking, learning and making meaningful connections between previous and new information. Similarly, a mind map can assist students in creating and learning appropriate structures; consequently to help them make sense of written topics, organize their thoughts into their written texts, and build connections between their thought and written language.

The truth is that teaching EFL writing using some common techniques is incredibly doable, even though EFL writing is a complex process (Bukhari, 2016). Besides, a mind map is a creative method widely used in education, government, and business that

is helpful for organizing, problem–solving, brainstorming, and training (Tucker et al., 2010) and it could give teachers information about their students' mental structures and the development of those structures (Tee et al., 2014). Therefore, the availability of mind map procedures in almost every field will provide an essential offering to student learning, particularly in the field of education, for teachers to fulfill the constructivist approach in the classroom.

As noted by Michalko (2011), a mind map stimulates the entire brain, brightens the mind of mental clutter, allows one to focus on the topic, aids in illustrating connections between isolated pieces of information, provides a clear picture of both the details and the big picture, enables one to a group and regroup concepts, encouraging comparisons, and requires one to concentrate on the topic, which helps transfer information from short–term to long–term memory. Furthermore, a mind map (or visual mapping) is a graphic tool to help learners for gathering, organizing, managing, and exchanging information. Moreover, it conveys information by arranging concepts/topics, ideas, words, or other items in a radial pattern around a central concept (Krasnic, 2012). Thus, specializing in key ideas written down in one's own words, then attempting to find branches and connections among the ideas and map the acquired data in a particular way will assist in comprehending and recalling new data. Overall, a mind map involves a system of associated and related ideas. Teachers should therefore highlight a mind map as a teaching method during the prewriting phase to motivate students and activate their previous knowledge to generate concepts. Thus, by encouraging students to gain a comprehensive or in–depth understanding of the writing topics, a mind map appears to be an effective tool for assisting students in planning and organizing their writing, broadening their writing skills, promoting creativity and making a good writing product.

The purposes of the study

The purposes of the study are:

1. To investigate the effects of using a mind map on EFL students' L2 writing development;

2. To explore the EFL students' perceptions on the relation between using a mind map and L2 writing development while they are engaging in writing processes.

Research questions

Established on the preceding explanation, the researcher has decided to use a mixed-method approach and conduct classroom action research. In particular, this study aims to answer the following research questions:

1. What are the effects of using a mind map on EFL students' L2 writing development?

2. What are the EFL students' perceptions on the relation between using a mind map and L2 writing development while they are engaging in writing processes?

The scope of the study

1. Content

The content of this study corresponds with a course description of the school curriculum following the Core Education Curriculum (2008) and the Fundamental English Course, by employing mind maps to develop Thai EFL students' L2 writing.

2. Population and Sample Group

The population for this study consisted of 30 Matthayomsuksa 6 students at Chiang Rai Provincial Administrative Organization School, selected by purposive sampling from six classes that were taking the course named "Fundamental English 6" for the academic year 2022 in semester two. Moreover, the data in this study were collected from the pre-test and post-test of L2 writing, participant observation, semi-structured Interview, attitude questionnaire, and document data.

Significance of the Study

The significance of this study for EFL writing contexts includes implications for teaching and learning English writing for EFL teachers and students. Regarding pedagogical implications, EFL teachers can motivate and encourage students to constantly use writing strategies or techniques that fit their learning tasks. Using mind maps in

classrooms is beneficial for the teaching and learning processes. Thus, teachers' use of mind maps can inspire students to continually develop their writing skills to improve their learning processes and English writing development. In addition, mind maps provide clear examples of how to properly facilitate, control, and monitor students' writing activity.

In terms of practical implications, the results of this study may provide suggestions for teachers to choose mind maps as a thinking tool in language classrooms. Using mind maps can encourage free-form thinking, increased creativity, holistic integration of information and knowledge, clear thinking through connections and organization, problem-solving, decision-making, and action-taking, improved memory and understanding, and is attractive, interactive, and fun. Besides, a mind map is likely to capture students' interest since they allow the students to apply their creative nature and contributes to their learning process by allowing them to use not only words but also images, diagrams, and charts to aid them in the steps of creating a written product. Similarly, it is easy, and enjoyable, and stimulates students' creativity in producing and shaping their thoughts. As a result, students are becoming more engaged and inspired to learn writing, and their writing skills are improving optimally.

Terms and definitions

Writing Development refers to the writing ability to write unified and coherent descriptive paragraphs to communicate English written texts with appropriate vocabulary, well-organized writing, and correct grammar.

Mind map refers to an effective way of getting data in and out of the brain and a visual thinking tool-it is a creative and logical means of note-taking and note-making that correctly "maps out" the thoughts and concepts.

EFL learners refer to studying English as a foreign language in a non-English-speaking nation and stand for English as a Foreign Language.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

The researcher has studied the principles, concepts, and related dissertations regarding the following topics:

1. Second Language (L2) Writing Development
2. Writing Process Approaches Used in an EFL Writing Context
3. Cognitive Processes in L2 Writing
4. Using a mind map to Promote Multimodal Literacies in EFL Writing Classroom
5. Previous Studies in EFL Learners' L2 Writing through the use of mind map
6. The Research Gaps
7. Conclusion

Second Language (L2) Writing Development

Writing in an L2 is a practice-oriented topic with two main elements: 1) Writing is a product as well as a process, and 2) the needs of the second language and multilingual writers differ significantly from those of "native" writers and thus require special attention (Atkinson, 2018). In addition, the emphasis on L2 writing has shifted from linguistic accuracy to various factors. Among these factors that raters most ordinarily use to evaluate the content of writing are communication of concepts, the writing assessment, excluding analytic or holistic scales, the number of main concepts, the logical association between the main concepts and the thesis statement, the utilization of examples to support concepts, attention to the content, and also the level of development of the main concepts (Ruegg & Sugiyama, 2010). Moreover, writing in a language other than the writer's native language is stated to as "L2 writing" and writing in a target language the writer is learning (Hyland & Hyland, 2019). Furthermore, as Hyland (2013) indicates, L2 writing refers to a field concerned with the knowledge of writing in a foreign language, as well as the analysis of the writing generated in that language, and it encompasses not only what people do, but also what they produce, and how it is taught, examined, and

learned. Besides, Kobayashi and Rinnert (2013) suggested that it is also important to consider writing development as bidirectional, in the context that second language (L2) writing can influence first language (L1) writing development. Also, Manchón (2012) stated that L2 writing development is concerned with much more than lexical–grammatical development; it is also involved with motivation, goal setting, and beliefs.

Influences of theory on L2 writing include contrastive rhetoric, the genre approach to writing, empiricism, cognitivism, pragmatism, and critical pedagogy. Contrastive rhetoric asserts that in their L2 writing, L2 writers recreate the formal rhetorical patterns of their first languages, making it harder to comprehend (Atkinson, 2018). The genre approach to writing examines formalized forms of written communication involving common social aims, or genres, and searches for ways of teaching their textual conventions (Atkinson, 2018). The philosophy of empiricism holds that real comprehension of the universe can only be obtained from sensory experience (Atkinson, 2018). Cognitivism is the belief that understanding the human brain and its operations is the best way to understand human action. Pragmatism maintains that the major purpose of second language writing instruction is to prepare students to face academic institutions' writing requirements (Atkinson, 2018). Finally, according to critical teaching, the main goal of education should be to criticize and overthrow the current grossly unequal status and to replace it with public institutions, including educational systems, based on real equality (Atkinson, 2018). In conclusion, writing development can also concentrate on various parts of the writing process and how writers' approaches to textual output vary as they advance in their careers (Larios & Coyle, 2013).

1. Writing as a Product

Writing product approach is one of the most often used strategies in classrooms worldwide (Palpanadan et al., 2014). In the view of writing as a product, students are encouraged to create a final product that may be linked to an example essay or the paper that teachers frequently provide. According to the writing product approach (Gabrielatos, 2002), at the initial stage of the writing process, a traditional technique is used in which students are encouraged to duplicate a model text that is regularly presented and criticized. Furthermore, Steele (2004) showed that the writing product

approach model consists of four stages. In stage one, Model texts are studied by learners, and characteristics of the genre are underlined. For instance, when studying an official letter, learners' thoughtfulness may be directed to the significance of paragraphing and the language used to make official demands. The emphasis may be on the techniques employed to make the narrative engaging if a student reads a narrative, and students may focus on where and how the writer applies these techniques. In the second stage, students train the emphasized aspects under controlled conditions, generally in private. So, students may be advised to practice formal request language if they are studying a formal letter. The third stage, in which thoughts are arranged, is the most crucial. Those who support this method feel that the structure of ideas is more important than the concepts themselves, and that language management is as crucial. The fourth stage is the learning process outcome. Students select from various writing assignments and demonstrate their fluency and competence in the language by applying the skills, structures, and terminology they have learned.

In conclusion, the writing product method focuses on the "finished outcome" rather than the complicated processes that occur during the writing process when teaching writing tasks. (Hinkel, 2002). This technique emphasizes the learner's completed task rather than how it is generated and is primarily concerned with its accuracy and form (Hasan & Ahkand, 2010). However, the writing product approach ignores the fact that ideas are generated and formed throughout the writing process (Agustiana, 2016), as this method mainly focuses on mechanical components of writing, such as syntactical structures and grammatical, as well as emulating models.

2. Writing as a Process

Students gain a better understanding of themselves and how to go through the writing process by concentrating on the process (Onozawa, 2010). Additionally, as Onozawa (2010) identifies, the writing process usually involves several steps standing on the level of the students and the purpose of the writing. As the teacher directs the students' writing, without initially emphasizing correctness or the final product, the students concentrate on writing instead of worrying about form (Agustiana, 2016).

A cyclical method of writing is referred to as a process approach. In this approach, students alternate between pre-writing activities and the revision stage (final stage) (Palpanadan et al., 2014). Likewise, Hyland (2013) mentioned that the process approach is beneficial for the students as this method places a greater focus on students' understanding of the process of learning the essence of writing rather than on methods of writing imparted by the teachers. Essentially, a common procedure, there are eight basic steps to the writing process adopted by Steele (2004) before the students produce the final writing product to be evaluated by the teacher (Palpanadan et al., 2014).

According to Palpanadan et al. (2014), eight fundamental stages adopted from Steele (2004) are stage one (Brainstorming), where students brainstorm and discuss ideas to come up with new ones. For example, students could talk about the attributes required for a career. The second stage (Planning/ Structuring) involves students writing down their thoughts and evaluating the utility and quality of the thoughts. In the third stage (Using a mind map), students create a mind map, spider diagram, or linear shape to arrange their thoughts. This stage supports students in arranging the structure of their texts by creating a hierarchical relationship of concepts. In the fourth stage (Writing the first draft), the students write the initial draft of their written texts. This stage occurs in the classroom, sometimes in pairs or groups. In the fifth stage (Peer feedback), students grow into readers of one another's work after exchanging drafts. Students understand how a writer creates something to be read by someone else by reacting as readers, which assists in improving their drafts. In the sixth stage (Editing), the drafts have retreated to their original writers, who then improve their drafts, and Peer feedback is used to make improvements. In the seventh stage (Final draft), students write their final drafts. Finally, at the eighth stage (Evaluation and teachers' feedback), teachers evaluate and give feedback on students' writings.

Regarding grammatical and syntactic structures, writing in the product method helps to reinforce writing abilities in a foreign or second language (Raimes, 1985). Besides, the major outcome of copying model texts is considered as writing development. This standard method boosts students to duplicate a model text that is often critiqued and provided at an early stage (Gabrielatos, 2002). Therefore, the students' end outcome

ought to be a coherent, error-free text, and students learn to set up, copy, and restructure a model text (Nunan, 1999). By contrast, in the process approach, as Abas and Aziz (2016) describe it, the following educational activities are designed to help students express themselves clearly and think and organize their thoughts before writing and rewriting drafts. These writing activities include 1) prewriting-thinking and reflecting writing, 2) planning-creating a strategy for achieving the paper's goal, 3) drafting-producing words, 4) pausing-moments, 5) reading-reading written work, 6) revising-re-seeing the content, 7) editing-concentrating on sentence-level elements, and 8) publishing-distributing the completed text.

On the other hand, the writing stages in the phase model of Chunling and Guoping (2009) adopted by Idrus and Ahmad (2020), are coordinated into three phases: pre-writing, writing and rewriting, and checking. Similarly, Hayes and Flower (1980) and Graham and Sandmel (2011) describe long-term memory components and organizing, planning, revising, and converting ideas into text are all included in this cognitive model of writing processes. In addition, Emig (1983) later claimed that all writing develops through three main stages: the subject stage, the preparation stage, and the writing stage, which includes writing the early draft, revising, and completing the final product. According to Murray (1968), the process of writing continually evolves the writer rediscovers topics, develops a more thorough understanding of the audience's needs, and collects and organizes concepts and ideas that may alter the initial writing plan, but that nonetheless reveal gaps in previous knowledge and produce further information. Similarly, Nabhan (2016) described the process writing approach implemented in EFL classrooms as improving students' ability to write descriptive paragraphs because it involved different steps, such as prewriting, drafting, revising, editing, and publishing. Students experienced each step of the process, and thereby they could discover their ideas and develop them into the well-written paragraph.

To sum up, the process writing approach indicates a modification in strength in teaching writing from the outcome of writing activities (the final written text) to techniques in which a text can be created (Hasan & Ahkand, 2010). This statement has affirmed by Dokchandra (2018) that students benefit from the writing process approach as it allows

them to be aware of their capabilities and at the same time, find out strategies suited to their respective learning styles.

3. Genres of Paragraph Writing

For writers, genres provide adaptable patterns that represent how people interact in societies. They propose methods for assessing and comprehending what is going on in their surroundings. Once writers understand their situation, they can use genres to motivate themselves to generate new and creative ideas and present those ideas to others. There are many different kinds of paragraphs, but here the researcher will focus on three basic types of paragraphs namely narrative, expository, and descriptive.

The first genre is ***narrative writing***. A narrative is a story written in a creative manner (written, spoken, poetic, and so on) that explains a sequence of fictitious or non–fictional events (Purba, 2018). Narrative writing often includes dialogue and can be found in biographies, poetry, fiction, and human interest stories. Moreover, the narrative is the genre that students are most exposed to the beginning at the primary level (Rahmawati et al., 2019), primarily because of its social function and simplicity. Narrative writing is used in public schools where in the classroom, students are frequently expected to create or retell tales and are graded on their ability to express themselves using exact vocabulary and grammatically suitable phrases in this genre (Sun & Nippold, 2011).

The second genre is *expository writing*. According to Uccelli et al. (2013), expository writing is a characteristically assertive yet epistemically cautious attitude, meaning expository writing uses established ideas and formal vocabulary. Additionally, expository discourse is critical because it is the most common type of writing used in the classroom from fourth grade through high school (Nippold, 2010). Besides, children often use expository discourse outside of school to discuss various topics, such as interests, relationships, sports, and to analyze events (Scott, 2010). Later, as writers, the students use expository writing to decide and give their order to the main supporting sentences, because the logics are different from one person to the other (Wali & Madani, 2020).

The third genre is ***descriptive writing***. The goal of descriptive writing is to help the reader picture something, a person, a place, an event, or all of these at once. Moreover, Sinaga (2017) claims that the author might define a subject using all five

senses. Besides, Carter (2015) pointed out that the subsequent essay and descriptive paragraph are usually among the first assignments that students must complete in composition classes. Suriyanti and Yaacob (2016) posit that descriptive writing is one of all the kinds of writing that should be taught and perfected by English lecturers and secondary school students, specifically those in grades seven, eight, and nine. Moreover, Sinaga (2017) mentioned that descriptive writing additionally uses precise language, such as accurate verbs, nouns, and adjectives, and a logical chronology wherein the order of events should be organized with the appropriate use of tense, relative verbs, action verbs, mental verbs, adjectives, and adverbs. Therefore, descriptive writing can be found in advertising, fiction, journals, poetry, and diary writing. In this current study, the descriptive writing genre was focused on according to the curriculum of the Chiang Rai Provincial Administrative Organization school.

In conclusion, the three genres of writing described above are the most common types of writing in school. Of these modes of writing, descriptive writing is the most universal and widely understood. In Thailand, **the Thai Ministry of Education has set targets for Thai students following** the CEFR (Common European Framework of Reference for Languages) that grade 12 students (Matthayomsuksa 6) should reach B1 proficiency. They should be able to deal with the majority of scenarios that may emerge when traveling in a certain location, produce simple connected text on well-known topics or of personal interests, dreams, describe experiences and events, ambitions and hopes, and briefly give reasons and explanations for plans and opinions, comprehend the main ideas of clear standard input on everyday matters frequently faced in school and work (Ministry of Education, 2014). Likewise, the Basic Education Core Curriculum (2008) seeks to increase students' understanding of cultural diversity and global perspectives, fostering friendship and cooperation with various nations. On this basis, the knowledge contents focus on four primary domains: language for communication, language and culture, language and its relationships with other areas, and language and its relationships with the community and the world. Therefore, descriptive writing is chosen in the writing activities of this study.

4. Mind Maps used in Writing Activities

Writing is the process of organizing one's thoughts and structuring them into a logical and unified system in which all ideas are interconnected and linked to the overall concept. As such, writing involves numerous challenges not only for the student learning to write but also for teachers to support all the connections in balance in writing (Bukhari, 2016). Moreover, guided writing is a critical technique in the classroom for helping students improve their writing skills. In addition, assistance can be provided in thinking through ideas, organizing ideas, examining grammar and language, collaborating on records and draft copies, and other aspects of writing practice (Suyanto, 2010).

As Buzan (2012) explained, students can use a mind map to correlate concepts, think innovatively, and find networks that they might not have made otherwise. Additionally, a mind map supports a free-thinking, brainstorming approach to organizing and planning because thoughts are shown in a graphical, radial, non-linear approach in a mind map. The mind map branches represent categorized tree structures, despite the non-linear grouping of thoughts. Their circular design presents the prioritizing of ideas that are usually linked with hierarchies in more direct visual signals. This approach to brainstorming invites users to identify and link notions without being confined to a single conceptual framework. Davies (2011) stated that students can use concept mapping to understand the connections between ideas, as a result, they better comprehend those ideas. In addition, students better understand related ideas regarding using mind maps to picture, considering relationships between topics, using a mind map to visualize, investigating associates between ideas, and using a mind map to accept the links between concepts (Davies, 2011).

Similarly, Windura (2013) describes a mind map as a study and thought method that employs both sides of the brain and the brain's processes, potential, and visualization capabilities. A mind map also requires a central theme with supporting ideas around it. Students can develop a coherent, explicit, structured, and memorable language using mind maps to explain, compare, classify, create a sequence, and draw conclusions. It also assists students in expanding their vocabulary by associating new and old words with visuals that aid in conveying meaning in a specific context (Khusniyah, 2019).

Consequently, the mind map technique is beneficial to students during the pre-writing stage, where students are encouraged to investigate concepts, produce ideas, and strive for and adopt a better degree of comprehension of the themes for writing so that they may arrange related ideas and improve their learning (Fiktorius, 2013; Bukhari, 2016).

What is more, multimedia learning allows students to resolve issues by exploring their ideas and their unique processes of writing, collaborating about writing, and actively participating in the process of discovering and sharing ideas, thereby fostering and improving peer learning, innovation, and individual creativity (Malik & Agarwal, 2012). As Istikharoh (2015) showed, multimedia is joining several media-like arts, texts, sound, and animations, with the data presented through computer technology. Likewise, Edwards (2014) explored the influence of technology use on children and found that a digital framework enabled the learners to create content. In addition, Truong and Zanzucchi (2012) advised that multimedia, such as audio-based feedback, electronic portfolios, and video essays, plays a significant part in improving and enhancing students' writing skills. Also, the study of Truong and Zanzucchi (2012) indicated that multimedia instruction to increase English-language writing ability facilitated students' writing skills. Thus, as Zhu (2010) mentioned, there are five advantages of using multimedia in the classroom. Firstly, multimedia can raise the amount of data, save time, and improve class proficiency. Secondly, multimedia empowers students to get feedback, know about their learning results, and correct their learning steps. Thirdly, teachers can integrate materials and present a variety of information with the support of multimedia. Fourthly, it helps to advance students' associative thinking. Finally, it facilitates communication between students and teachers as well as students and students.

Writing Process Approaches Used in an EFL Writing Context

In the EFL classes, most individual students usually ask for instruction in passing English skill exams. The classroom atmosphere has become rather more competitive. EFL students appear to lack social interaction with their classmates and stimulation to learn English at school. Moreover, these EFL students rarely develop cognitive skills because they were taught in a recitation rather than a critical thinking style. These obstacles

impede the advancement of students' English language proficiency in communication and social and cognitive skills. The process approach is also thought to improve language instruction and students' learning development to assist EFL students with both language and socio–cognitive skills. This process approach, however, has rarely been used in Thai EFL classroom instruction, where far more emphasis is usually placed on the learning product (e.g. scores and grades) than on the learning method (e.g. learning activities and room participation) as specified in a people language curriculum (Puengpipattrakul, 2014). Additionally, teaching the process approach in a writing class enhances students' cognitive process, which is any mental process that learners use to acquire skills, such as generalization, inferencing, deductive learning, monitoring, and memorizing. Thus, there is an urgent need for EFL writing classrooms to assist students' English writing development by engaging in writing processes.

The Process Approach is proposed to improve EFL students' L2 writing development. According to Steele (2004), the Process Approach Model is separated into eight. In the first stage, conceptualizing, ideas are generated through brainstorming and discussion. In the second stage (planning or structuring), concepts are translated into notes and the quality and advantages of the concepts are selected. In the third stage (a mind map), students form concepts through mind maps, spider grams, or linear forms to create a hierarchical relationship between concepts and the structure of written texts. In the fourth stage (writing the first draft), students write the first draft of the category, sometimes in pairs or groups. In the fifth stage (peer feedback), drafts are exchanged so that students can become readers of their peers. In the sixth stage (editing), based on feedback from peers, drafts are returned and revised. In the seventh stage (final draft), a final draft is composed. Lastly, in the eighth stage, evaluation and feedback are provided to evaluate writing performance.

Al–Bataineh (2010) assumed that the weakness of writing ability may be because of the failure of using traditional teaching methods whereby memorization and recitation techniques are encouraged in the classroom, which prevents students from developing critical thinking, problem–solving, and decision–making abilities. Additionally, Al–Sobh and Al–Abed Al–Haq (2012) declared that there are several reasons behind EFL

learners' weakness in writing ability, with the most essential reason being the methods and techniques of teaching.

Thus, the teaching of writing needs to convert from the conventional learning model (predicated on the assumption that knowledge can be transferred entirely from the teacher's mind to the student's mind) to the trendy learning model (constructivism). Constructivist learning models are not satisfied in isolation but are fully satisfied by their interests, abilities, and learning desires (Wahyuni, 2013).

1. Writing Strategies Used in EFL Context

Writing strategies play an essential role in learning because they help students write more effectively. Students use useful writing strategies to complete their writing assignments. According to Silva and Graham (2015), a writer's conscious mental activity engaged in the pursuit of solving a problem in writing is defined as a writing strategy. In addition, Nopmanotham (2017) focused on four writing strategies including social strategies, metacognitive strategies, affective strategies, and cognitive strategies, as presented by Oxford (2011) and utilized through the writing process of planning, drafting and revising. Besides, Aliyu et al. (2016) found that students in Malaysia who developed metacognitive awareness were more likely to attain higher writing achievement levels. Moreover, Talapngoen and Deerajviset (2017) found that using writing strategies through a think-aloud protocol can be useful to students in terms of enlightening their writing ability, motivating writing strategy use, and enhancing self-awareness in using writing strategies during the writing process. Mekala and Geetha (2021) also presented that the metacognitive strategy was highly effective in improving the contextual attributes of writing for 27 Indian students.

In summary, the current education of writing skills also creates a significant aspect of learning and teaching, which could be developed through metacognitive strategy-based writing teaching, while learners have demonstrated higher-order thinking in language classrooms such as Planning, Translating, and Reviewing (Hayes & Flower, 1981).

2. The EFL Learners' Learning to Write Strategies

EFL teachers now have a variety of approaches for teaching writing to improve their students' academic writing abilities. At least three major approaches can be identified as the product approach, the process approach, and the genre approach. Previously, the product and process approaches had influenced most of the teaching in the EFL classroom (Klimova, 2014).

At present, genre approaches have developed and have influenced the teaching of writing in a big way (Elashri, 2013). Additionally, Dirgeyasa (2016) stated that the genre approach is a method of teaching and learning writing that combines the process and product approaches. It is also a kind of coin with two facets, each with its characteristics and functions. Moreover, Saputra and Marzulina (2016) found that teaching writing using the process genre approach significantly improved students' writing proficiency by allowing them to feel passionate before they begin writing a paragraph or composition and to organize their thoughts, ideas, experiences, and sentences.

Thus, a genre–based approach is one in which writing is regarded as both the process and product of the processes of writing, and it is supposed to bring some benefit when it can stimulate the learners to be enthusiastic to write in English.

Cognitive Processes in L2 Writing

Underpinning cognitive theory, memory, thinking and reasoning, spatial processing, problem–solving, language, and perception are all examples of cognition (Richland et al., 2016). According to cognitive theory, behavior displays the development of different psychological structures, organized units, or patterns of thought that affect how children interpret information (Lefa, 2014). Kozbelt (2011) stated that cognitive theories highlight the creative process and person. In his terms, "process" means the function of cognitive processes as a foundation for original thought, and "person" means individual differences in such mechanisms. Moreover, the cognitive theory of multimedia learning is based on a model that involves several processes for selecting, organizing, and interacting with information: the selection of essential words for processing in verbal memory, the selection of essential images for processing in visual memory, the organization of chosen words in

the verbal thinking model, the organization of thought images in the visual thinking model, and the integration of verbal and thought presentations with prior knowledge (Stanković et al., 2018). According to Hofmann and Asmundson (2017), the cognitive theory proposes that an extensive cognitive system exists in a taxonomic structure, ranging from surface-level thoughts (products) to information-operating mechanisms (processes) and deep structures (schemas). It is crucial to note that theories of cognitive development seek to explain the mechanisms of change and, consequently, development rather than merely describing the abilities of children across ages or between children, adults, and aging populations (Richland et al., 2016).

Piaget (1896–1980) was the most influential contributor to the developmental cognitive theory. He observed infants in various settings and utilized movement to determine what the infants were thinking. He was the first to propose the concept of "stages" of development, which linked infant overt behavior to stages of cognitive constructs available to the infant. His goal was to learn how infants think by observing their interactions with objects in their environment. Piaget's resulting theory states that perceptual, preoperational, concrete intellectual operations and formal operations are the four major stages of mental development. (Ahmad et al., 2016). Piaget's theory provides a solid framework for comprehending children's ways of doing and thinking and their capacities at various stages of development (Devi, 2019). In addition to Piaget's theory, Vygotsky (1978) emphasizes two major aspects of the learning process, that is, culture and language. Moreover, Vygotsky defines three key concepts in cognitive development: Language is the root of culture, and individuals learn and develop within the context of their role in the community. Thus, education involves the working procedure, learning, and teaching, which teachers must carry out comprehensively and must be realized via authentic activities based on real life circumstances that are significant to students (Vygotsky, 1978). Like Piaget, Vygotsky considers that young children are inquisitive and actively involved in their learning and the discovery and creation of new concepts/schemas. Conversely, Vygotsky emphasized social contributions to the development process, whereas Piaget emphasized self-initiated discovery (McLeod, 2018).

1. Cognitive Processes during L2 Writing

Cognitive and mental developments comprise the background of an individual's knowledge. These developments are the primary components of an individual's mind when considering an individual's background. Moreover, knowledge can be further understood with Piaget's theory of mind and schema, that how children handle tasks in the world around them—influences their mental stability. Learning occurs when an individual deals with environmental issues, especially when finding or creating balance in the environment. A child learns when he solves a problem, and knowledge is constructed from the actions of solving a problem. Learning comes from interacting with the environment, the environment helps to produce knowledge, and then knowledge brings achievements. In contrast to Piaget, Vygotsky's theories emphasize the importance of social interaction in cognitive development. Children and their peers co-construct knowledge around guided learning within the zone of proximal development, where cognitive development originates from social interactions. Vygotsky also refers to tools of intellectual adaptation, such as mnemonics and a mind map, which permit children to use their basic mental processes to be more adaptable and influenced by culture (McLeod, 2018).

Cognitive research suggests that L2 acquisition is similar to an outstanding example of general learning mechanisms in the human brain since it employs the same concepts and models as learning theories in terms of cognition (Nhu & Han, 2019). Moreover, Elgamal (2018) indicated that second or foreign language learning occurs when an individual has not mastered his or her first language. So, other elements, particularly cognitive ones, play a role in the learning process. Atkinson (2011) clarified the link between cognitive components and the function of context or environment in the learning process, suggesting that the L2 learning process incorporates the learner's mind and body and the surrounding environment. In addition, Brahim (2016) showed that theoretical frameworks for L2 acquisition are drawn from several areas and thinkers. These theories can mainly be classified into three groups based on three prominent views: the behaviorist view (Skinner's theory), the innatist view (Chomsky's theory), and the interactionist view (Piaget's theory). Furthermore, Brahim (2016) claimed that many elements, including individuals' genetic origin, culture, and prior learning experience, might impact their

learning styles. Nawal (2018) mentioned that L2 academic writing requires thinking ability in the L2 and achieves tremendous success instead of thinking in the L1 and then interpreting into the L2. Moreover, Bhela (1999) pointed out that if there are gaps in their L2 syntactical structures, learners frequently use the first language's syntactical structures to write in the L2. Therefore, students will be more successful and engaged in the second language if teachers adapt their teaching techniques to the students' learning styles.

The most popular writing cognitive process model has been developed by Hayes and Flower (1980, 1981; Hayes, 1996), who explains that planning, translating, and reviewing are the three basic stages that a writer may face while writing, as follows: Planning includes three strategies: generating ideas, organizing, and goal setting. The approach for creative ideas requires accessing relevant data from the task environment and long-term memory, which is a source of knowledge about the dialogue and the topic. The organizing procedure includes selecting the subject content recovered during the producing phase and arranging this subject matter into writing cohesively and coherently utilizing knowledge of the long-term memory and the task environment for the documentation. The goal-setting technique involves transmitting concepts and information, again through understanding the long-term memory and task context for documenting. The act of composing, also known as "translating," is the second phase in the writing process. In this process, writers make their thoughts evident by translating them from a linear or hierarchical design into words (Hayes & Flower, 1981). It involves converting thoughts into the language (text generation) and then into written words (translation) to produce a coherent and cohesive text. Reviewing is the process of assessing what has been prearranged or written. In these strategies, the writer goes through the written material to ensure it meets its objectives. This process includes editing grammatical errors as well as modifying the writing's content. Besides, a monitor controls the basic processes of planning, translating, and reviewing, also referred to as executive control (Hayes, 1996). The monitor is a meta-process that oversees the three main processes described above.

An effective and efficient writing process more simply called writing well, entails the capacity to consider thinking and to continually coordinate and review the mental processes of writing to maintain the focus of attention and change it among different techniques to guarantee that excellent writing progresses. Additionally, the writer's long-term memory, which can be both internal to the mind and external, like books, is a repository of information about the subject and audience as well as writing plans and problem representations (Hayes & Flower, 2004).

To sum up, the cognitive approach understands the learner as a thinking being and an active information processor. Applying the cognitive approach to develop different types of activities will improve learners' intelligence and critical thinking in various contexts, specifically during the writing process.

2. Cognitive Theory of Multimedia Learning (CTML)

The work of Richard E. Mayer and other cognitive researchers, who contend that multimedia supports learning in the human brain, popularized the CTML (Sorden, 2012). Additionally, CTML is based on the premise that students attempt to forge meaningful connections between words and images, enabling them to learn more deeply than with words or images alone (Mayer, 2009). Moreover, Multimedia learning originates in the cognitive architecture that enables human learning and the technological characteristics that support cognition most effectively. Furthermore, CTML is especially relevant in computer-based, and online learning environments where auditory and various forms of visual stimuli (e.g., text, diagram, photo) can be easily used and integrated into a curriculum (Greer et al., 2013).

Human memory is organized into three sections in the CTML model for data processing and learning: first, sensory memory, which is a sensory reproduction of the presentation for a very short time; second, working memory, which is in charge of short-term processing of the provided material; and third, long-term memory, which contains knowledge that has been stored for long periods (Mayer, 2010). The CTML model also shows different cognitive processes that contribute to learning, specifically selection, organization, and integration. The selection of words and pictures (images) represents the transferring of presented material for further processing; the organization of words and

images represents coherent presentation; and integration represents a cognitive association of presented material with appropriate knowledge previously acquired from long-term memory (Mayer, 2008, 2010). CTML is likewise based on three cognitive science learning concepts: the human information processing system includes dual channels for visual/pictorial and auditory/verbal processing (i.e., dual-channel assumption); the processing capability of each channel is restricted. (i.e., limited-capacity assumption); during learning, active learning requires performing a coordinated set of cognitive processes. (i.e., active processing assumption) (Mayer, 2014). Hence, there are three types of processing in multimedia teaching, namely extraneous processing which takes up limited cognitive processing capacity without contributing to learning, necessary processing which involves selecting and organizing related information in working memory, and generative processing which involves reorganizing the material and assimilating it with prior knowledge (Mayer, 2014).

3. The Links between a mind map and Cognitive Processes

According to Mislia et al. (2018), the cognitive process of thinking is a natural process that generates mental activity for students to obtain information and critical thinking. The ability to think creatively is one of the most crucial cognitive abilities to acquire in education (Turkmen & Sertkahya, 2015). This skill is frequently described in various thinking terms, and most assessments of creative thinking to date have focused on measuring divergent thinking processes (OECD, 2019). An effective way of improving critical thinking is a mind map.

Additionally, Davies (2011) asserted that students could conceive and explore connections between topics through a mind map. Furthermore, Kireeva (2019) demonstrated that a mind map's hierarchical information structure is comparable to the brain's linked system of thoughts and concepts. The brain forms and links the inputted information between the "old" and "new" knowledge, integrating it into the current cognitive framework while learning new knowledge. Similarly, when observing and evaluating new information, students employ writing or digital tools to physically express and arrange visual concepts for further absorption of recycled and relevant knowledge into the cognitive structure of their brain, enhancing retention and recall ability.

Consequently, Buzan's model of a mind map (Buzan, 2012) is the most effective and innovative method for getting data into and out of the brain. A mind map may be described as a map of the creators' minds. The mind map learning method is intended to increase students' knowledge via creative activities that translate a concept's fundamental idea into a mind map. Students can use a mind map to investigate associations between concepts by generating free-form interactions with material stored in their permanent memory, allowing them to mirror essential concepts with personal experiences or occurrences (Jackson & Eddie, 2016). Kireeva (2019) explains that mind map was initially done by hand, but due to technological advancements, mind map activities may now be performed with mind map software that promotes constructivism based on learning design. Recalling, enhancing creativity, solving issues, focusing on a subject, and organizing ideas are just a few of a mind map's educational and cognitive benefits (Dixon & Lammi, 2014). In summary, a mind map is an excellent cognitive strategy for students who must acquire, understand, and present vast amounts of complicated knowledge (Buzan, 2012).

Using a Mind Map to Promote Multimodal Literacies in EFL Writing Classroom

Multimodal literacy learning in schools and society starts by acknowledging that reading and writing are seldom performed separately but are closely interconnected. This is also true of multimodal texts, which have become integral to daily life for many people across cultures and societies. This phenomenon has been made possible by how simple it is to create and distribute digital content via the Internet and mobile technologies, including music, video, writing, games, apps, and other forms of digital media (Mills & Unsworth, 2018).

A recent study conducted at a local Chinese school examined the utilization of multiple literacies. Ganapathy (2014) discovered that students engaged in multimodal literacy practices admirably, as evidenced by teachers' positive comments and students' increased interest in their ESL writing classes. Effective learning outcomes were achieved, and students were highly engaged in their studies. Additionally, the importance of teachers' freedom in how to implement multiliteracy has been addressed by all informants

(Salavati, 2016). Currently, utilizing Interactive whiteboards, PowerPoint for lecture notes, and asynchronous discussion forums in place of face-to-face tutorial discussions, many teachers use digital technologies to support teacher-directed approaches to improve the quality of lecture presentations (Beetham & Sharpe, 2013). Furthermore, Ganapathy (2016) suggested that multimodal approaches integrated into the teaching and learning of English as a second language can promote student autonomy in learning, enhance motivation to learn, and facilitate multiple learning styles.

These studies show that the teacher's role in the classroom, and thus the learning of students, could be improved by utilizing new pedagogical methods such as multimodal literacy and mind maps. Traditionally, institutional policies tend to push teaching in a particular pedagogical direction. Some researchers suggest that teachers who are skeptical of newer pedagogical methods perceive multimodal tools as "fragmented" only because of their previously established, traditional conceptions of teaching and learning (Papageorgiou & Lameras, 2017). Further work with multimodal literacy would improve the effectiveness of this pedagogical practice.

Using a mind map as a multimodal tool – Professional writing is frequently a concerted team event in which the process is as significant as the final output. Additionally, Grant (2012) mentioned that a mind map and topic outlines are examples of draft products that are officially taught and graded in professional communication courses at universities to enhance learning and professional improvement. 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. A mind map, which Grant and Archer (2019) described as both a mental and physical process, enables individuals to generate ideas in novel ways, encounter and transform ideas, and then compose these into significant arrangements in a medium of choice. The mind map is also a technique for characterizing subject material comprehension in multimodal forms (Hanewald & Ifenthaler, 2014).

In an age of information overload and struggling enterprises, knowledge workers require efficient organizational tools to brainstorm, collaborate, and analyze ideas to compete and grow in a changing world. Recent years have seen the development and use

of software mapping tools by academics and educators for many educational purposes. FreeMind, NovaMind, OpenMind, XMIND, and iMindMap are some of the most popular mind map software programs. Ratheeswari (2018) notes that ICTs (Information and Communication Technologies) offer opportunities for both students and teachers to adapt learning and teaching to individual needs and that shifting societies are inadvertently pressuring schools to respond appropriately to this technological innovation. As such, multimedia resources and tools could include, for example, online quizzes, interactive videos and pictures, recorded lecture presentations, discussion forums (synchronous and asynchronous), and visual representations of student progress (Sharples et al., 2016). As a result of new technologies, mind maps can now be used as collaborative online tools that can also help with negotiations (Araujo, 2019).

1. **Using a Mind Map to Enhance Cognitive Processes**

Nowadays, at both the educational and corporate levels, creative thinking abilities are regarded as one of the real talents for the twenty–first century, as these skills permit people to maintain flexibility and offer them the capacity to deal with chances and challenges in their complex and rapidly changing world. Creative thinking skills can be classified into three types: creative thinking skills and innovating; critical thinking and problem–solving; and metacognition thinking (Griffith et al., 2012). Turkmen and Sertkahya (2015) posited that the most important thinking skill to progress in education is creative thinking skill. Ola and Walid (2020) described creative thinking as correlated with critical thinking and problem–solving. This perspective has supported Keles's (2012) claim that a mind map is a powerful tool for teaching and improving students' creative and critical thinking abilities, as well as for facilitating students' learning because the mind map encourages active learning and can be used as a tool for self–study that sharpens attention to important rather than unimportant features of a task or subject. A mind map also aids in the conceptualization of fundamental principles of large amounts of information and allows the learner to assemble and integrate many concepts (Wickramasinghe et al., 2011).

2. Using a Mind Map to Enhance L2 Writing

Rajapriya and Kumar (2017) indicated that mind map is an effective pedagogical tool because their visibility promotes better understanding in students, and their flexibility means that they possess several uses in the classroom. Moreover, Bukhari (2016) showed that the mind map technique employed in the pre-writing process produced significant outcomes in Saudi intermediate learners, specifically more advanced use of cohesive devices, consecutive patterns, and connoted concepts. Hallen and Sangeetha (2015) discovered that the mind map method increased the understanding of VIII standard students in Tiruchendur Taluk, improved their marks on the public examinations, and enabled them to aid the teacher to teach English more effectively. Additionally, Grant and Archer (2019) showed that the practice of mind mapping enables students to explore and construct a knowledge base by generating ideas that reflect and emphasize their topic of interest through the arrangement of these ideas in hierarchical relationships.

To sum up, AS'ARI (2016) recognized that a mind map works as a creative method of associating and imagining ideas for a topic. Furthermore, by integrating three-dimensional organization, dynamic hierarchical structure, and node folding, mind map software may be utilized successfully to organize significant large amounts of information.

Previous Studies in EFL Learners' L2 Writing through the Use of Mind Maps

Some researchers have studied the effect of mind maps on teaching writing.

First, the study on a mind map was done by Suyanto (2010), who found that teaching writing, the mind map technique is more effective than the modeling technique to seventh-grade students of a junior high school of SMPN 1 Prambon, Nganjuk. The students could use a mind map to increase their writing ability as it helped them to generate, elaborate on, and organize their ideas. Similarly, the writing skill achievement of the students with higher IQs was better than those with low IQs, suggesting a correlation between teaching techniques and students' IQs.

Next, Nurlaila (2013) investigated the usefulness of mind maps for teaching the writing of descriptive writing to seventh graders in a Junior High School in Bandung. This study employed a mixed method between pre-experimental design, especially one group

pretest–posttest design, and questionnaire and interview techniques. The results revealed a marked enhancement in the students' writing ability. Furthermore, the results of the questionnaires mainly indicated positive responses toward the mind map technique for writing descriptive texts. Finally, the results of the interviews recommended that the students enjoyed this mind map technique because they found it motivating and enjoyable for writing descriptive texts. It improved their ability to write descriptive texts, increased their vocabulary and creativity, and enhanced their understanding of ways to organize sentences and form ideas. Finally, the researcher mentioned further use of the mind map technique for teaching the writing of different kinds of text at varying levels of schooling.

Similarly, Purnomo (2014) conducted classroom action research to study the improvement of descriptive writing skills of eighth–grade students through a mind map. The study conducted in four meetings over two weeks. The data was obtained by giving each cycle a pre–test and a post–test, and the results showed improvements in the pre–test and post–test scores. Students' interest in the lesson increased as they engaged in the teaching–learning process. Based on the analysis, the researcher concluded that the mind map technique could improve students' writing skills. Besides, a study conducted by Padang and Gurning (2014) on successful students' achievement in creating descriptive written text through mind map strategy among 30 students in the eighth grade of SMP Swasta HKBP Pardamean demonstrated that mind map Strategy could advance the students' achievement in writing and support teachers in their lessons of teaching writing.

In the same way, the study of Vijayavalsalan (2016) examined student essay writing in higher education by focusing on how the mind map was efficiently used as a strategy to assist and improve students' writing skills. The data was collected through a questionnaire and analyzed to evaluate the use of a mind map as a pre–writing brainstorming strategy. The findings of this study approved that planning an essay before writing, along with using the mind map technique to promote more effective essay writing in students' assignments, thereby making students' essay writing more effectively.

Likewise, Yunus and Chien (2016) investigated the perceptions of Malaysian undergraduate students regarding the use of mind map strategies on an English writing test. In this study, quantitative and qualitative data were collected using a questionnaire.

The data analysis revealed that most Malaysian students viewed the use of mind map strategies to improve their writing skills as beneficial because it helped them plan their writing, develop a deeper understanding of the writing topics, and promote creativity in writing.

Additionally, Sari and Sakdiah (2016) developed a media mind map through the ADDIE model in the teaching material with 30 students. Data collection was conducted by using mind map sheets of students' work. The results of this study discovered that a media Mind map occurs in five stages: analysis, design, development, implementation, and evaluation. The study concluded that a media mind map could be a viable and effective tool for the learning process. Karim et al. (2016) revealed that the main advantages of brainstorming and mind maps are that they facilitate students' writing procedures and allow students to explore the use of technology for brainstorming and mind map activities.

Moreover, Bukhari' s study (2016) on Saudi intermediate learners analized appropriate mind map techniques to increase EFL learners' writing ability. This study reviewed and examined traditional techniques utilized in teaching writing to Saudi intermediate learners, recognized suitable mind map techniques, and suggested an application procedure for increasing writing skills. The study sample consisted of 40 intermediate English learners and 20 English teachers from the English Language Institute. The study was distributed into two phases: a survey phase and an experiment phase. The study began with the learners' placement tests and a questionnaire distributed to EFL teachers to gather information about common techniques and problems faced in teaching writing. Microsoft Excel and SPSS were used for the statistical analysis of the data. The results revealed that the learners who used a mind map demonstrated greater cohesion and coherence in their writing, improved the structure of their content paragraphs, and produced longer writing. Therefore, it appeared that the hierarchical structure of the mind map techniques enhanced the EFL learners' writings.

Furthermore, Ningrum et al. (2016) determined the influence of mind maps as a pre-writing strategy for generating ideas in EFL students' argumentative writing and included differences in the students' gender and learning styles. By showing experimental

research at the university level in Indonesia, two existing TOEFL classes at the State Islamic Studies (STAIN) in Kediri were designated by a lottery and classified into two groups. One group used linear notes, and the other group used a mind map. For the data analysis, ANCOVA (analysis of covariance) was utilized with students' TOEFL scores as the covariate variable. The result findings showed no significant difference between the control and the experimental groups' idea development in writing. The results also showed no important differences between the genders of the participants or their learning styles concerning the students' idea improvement in writing. Additionally, there was no significant interaction between treatment and gender differences or collaboration between treatment and learning styles.

In addition, Sasongko (2017) investigated ways to improve students' writing skills using the mind map method and classroom action research (CAR) in one cycle at SMP Negeri 2 Geneng. The subjects in this study were Class VIII–A which consisted of 20 students. This study collected data using writing tests, both a pretest and a posttest. The results concluded that the application of the mind map method yielded positive impacts on the student learning outcomes and capability for writing descriptive texts, based on the increase in pretest and posttest scores of each student.

Further, Zhang (2018) discovered links between specific mind map instruction during the pre–writing stage and Chinese EFL learners' argumentative writing quality. The experimental group performed significantly better than the control group in the content and organization of their writings, according to a comparison of the mean scores of post–experimental argumentative writings between the two groups. Through interview analysis, it was determined that participants viewed mind maps as a useful tool for organizing their writing and that their attitudes toward English writing improved. Also, Alahmadi (2020) pointed out that a mind map promotes vocabulary learning by heightening the understanding of vocabulary words used in writing. Additionally, mind map facilitates vocabulary learning by improving Saudi students' motivation for learning new words. The results of these studies suggest that the use of mind maps improves the teaching of L2 writing significantly.

The Research Gaps

Based on the above review of mind map techniques, several research gaps have been discovered concerning the effects of using a mind map on EFL students' L2 writing development, and the present study intends to address these gaps. First of all, the goal of this study is to explore students' perception on the relation of using a mind map and L2 writing development while EFL students and engaging in writing process. In addition, the present study aims to fill the research gap where not enough writing studies exist that focus on both writing products and writing processes. Previous research has focused primarily on university undergraduate students, but little research has focused on high school students in Thailand. However, current research has been focused on using mind mapping to enhance L2 writing abilities; instead, 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 and students' perception of the relationships between using a mind map and L2 writing development while EFL students are engaging in writing processes.

Conclusion

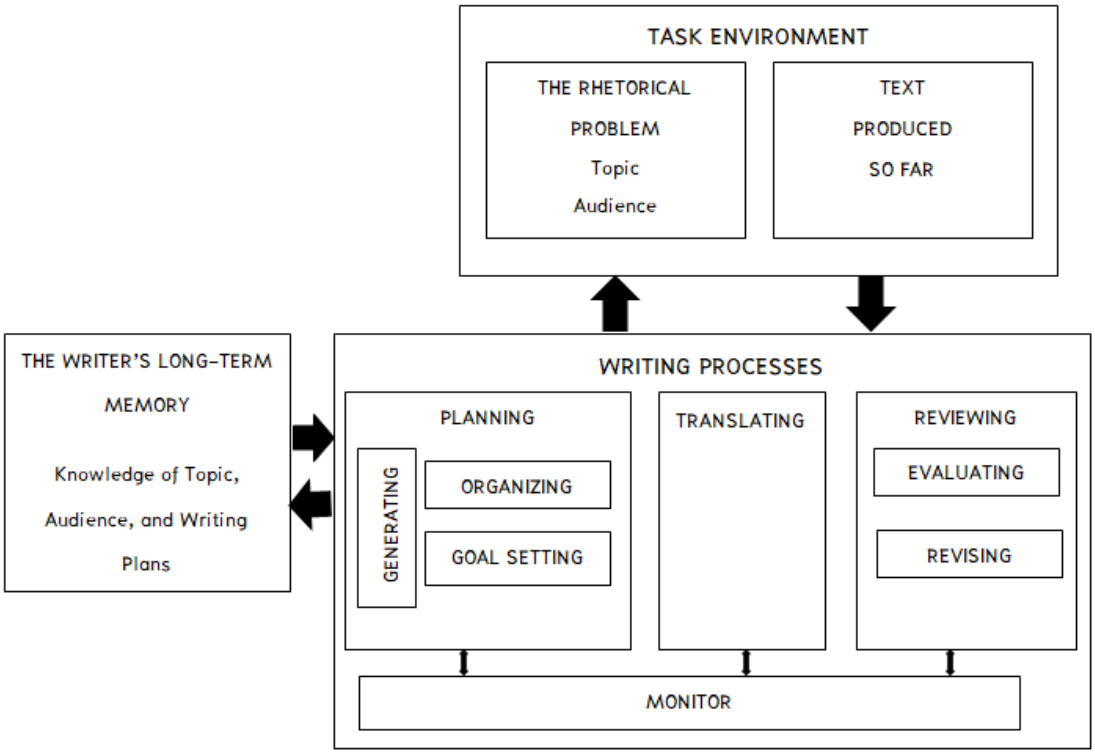
Many EFL high school students graduate with inadequate writing skills. Several studies have shown that a mind map as a useful writing strategy can assist students' L2 writing achievement and encourage positive attitudes. Moreover, EFL students can gain assistance with the abilities and mental processes required for writing by using a mind map as a visual thinking tool. In sum, writing in a second language is a complex skill as it involves a variety of cognitive processes. Thus, it is beneficial to investigate writing strategies and the use of mind maps that can

enhance students' writing skills.

CHAPTER III

RESEARCH METHODOLOGY

This chapter discusses the research design, population and sample, instruments, data collection, and analysis. The cognitive process theory of Hayes and Flower (1980, 1981) (Figure 3.1) served as the theoretical framework for this study. Thus, the flow chart below illustrates the procedure, theoretical frameworks, research approach, and research methodology of this study's research.

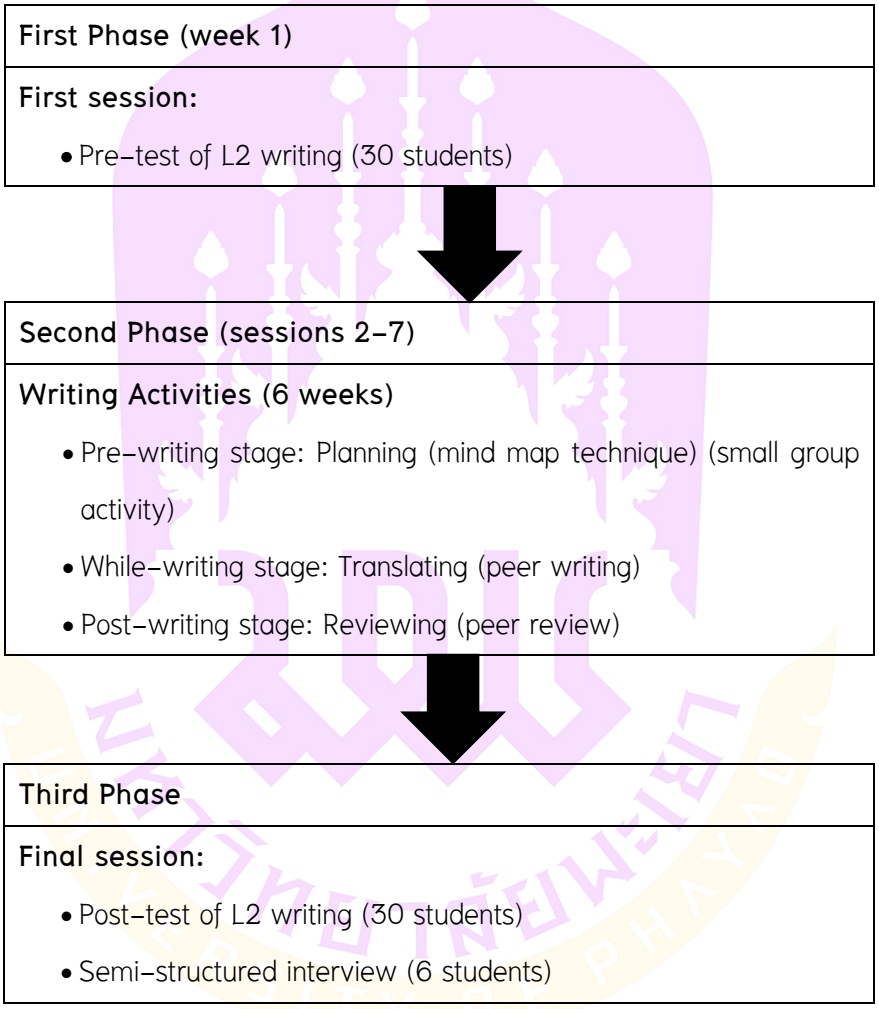


Figures 1 Theoretical Framework: The Cognitive Process Theory of Hayes and Flower

Slurce: Hayes and Flower, 1981, p. 370

Research Design: Mixed-method

The mixed-method research design is appropriate to this study. In order to collect data, both quantitative and qualitative methods were utilized. This study aims to investigate the effects of using a mind map to enhance the L2 writing development of EFL students. Consequently, the research procedure was carried out according to Figure 2



Figures 2 The Research Procedures

Research Procedures

1 The Writing Activities

In this study, the EFL writing activities were conducted for six sessions; each session was two hours, totaling 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 thinking 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 a 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.

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) Cognitive Process Theory was used as the theoretical framework for this research study.

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. The Writing Intervention: Mind Maps

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 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 mind mapping stage, 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.

Figures 3 A Sample of a Mind Map

Source: Buzan (2012, p. 202)

The procedures to teach descriptive paragraphs are related to the mind map technique (Buzan, 2012). First, the researcher, as the teacher, provided information. The teacher is a facilitator in the learning process, guiding information and explaining what

students have learned. Second, the teacher clarified topics and relevant information and explained descriptive paragraphs. Third, the teacher suggested that the students compose a descriptive paragraph by using the information draft in a mind map. Finally, the teacher instructed the students to collect their assignments. To collect the research data, a mind map is used as a thinking tool. It is easy to construct, interestingly explores ideas with some branches, and is organized like a spider web.

Population and Sample

The research population consists of 177 Matthayomsuksa 6 students at the CRPAOS School enrolled in the "Fundamental English 6" course for the 2022 academic year. The Thai EFL students took this course for six classes in the second semester, but only one class (Genius Science–Math Program) participated in this study. As a result, 30 EFL participants were chosen through purposive sampling, allowing the researcher to target niche demographics and collect specific data for the study. Thus, the experimental group was taught by using mind maps to advance EFL learners' L2 writing development.

The sample of this study was 30 high school students who studied in sixth grade in a high school in Chiang Rai province. These 30 students study in the Genius Science–Math program, which requires English proficiency in the CEFR B1 level. In order to collect qualitative data, six students were selected from these sixth–grade students (2 high proficiency students, 2 intermediate proficient students, and 2 low proficiency students) who got a pre–test and academic achievement testing through the writing rubric adapted from Al–Naibi et al. (2018).

Data Collection

The research instruments in this study were divided into five sections; L2 writing pre/post–test, observation form, semi–structured interviews, documentary data, and attitude questionnaire. These are as follows.

1. L2 writing Pre–test and Post–test

The pre–and post–tests were created for a particular writing topic entitled "One day in school". Thirty participants were given 20 minutes to write an English

paragraph of at least 50 words. In the first week, the pre-test was prepared for the participants, and in the final week, the post-test was conducted.

2. Participant Observation

The participant observation was used as a data collection technique to obtain qualitative data from the EFL writing context and the EFL students' performances while engaging in the writing activities through the use of mind maps. The main focus of the participant observation was the students' behaviors and thinking processes while employing a mind map in writing assignments.

Audio recordings of observations were used to support and back up the qualitative data from participant observations. In this study, the six students' oral language data and writing behaviors were recorded during six sessions of the writing activities (pre-writing, while-writing, and post-writing) for a total of 12 hours. Before participating in this study, the students were asked to sign a consent form to confirm that they accepted and were aware that their learning behaviors were recorded during the writing activities. In order to record the oral language, the researcher put the audio recorders in front of the six students. After that, the researcher transcribed the oral language in Thai (L1), according to the original language as original oral data. Then the researcher chose only the part relevant to learning behaviors of writing to translate into English. Therefore, the audio recordings provided qualitative data to reveal how the students' talk to the teacher and between their peers and themselves can facilitate their learning of English writing.

The observation checklist was used to group the evidence from each student so that the researcher gained quantitative and qualitative data from the participant observation. The observation checklist is shown in Appendix B.

3. Semi-Structured Interview

The semi-structured interview was used as a research instrument to elicit qualitative data. According to Edwards and Holland (2013), the interview is used to collect qualitative data since this research tool involves the natural implementation of qualitative purposes.

The semi-structured interview examined the effects of using a mind map in a small group. Additionally, in this present study, the semi-structured interview was

conducted after the last session of the writing activities and was conducted with a focus groups of six different proficiency EFL students, to learn about students' attitudes toward writing in English and how they use writing strategies. Moreover, the semi-structured interview questions involved three questions that the researcher adapted from the previous study by Kamli (2019). The questions were (1) "What problems do you confront when writing in English?", (2) "What strategies do you use to overcome these problems?", and (3) "Does a mind map help you to write in English? How?"

The semi-structured interview consisted of four sessions to answer in-depth answers from the participants regarding the effects of using a mind map on the participants' writing processes in each writing step. Firstly, the researcher used ice-breaking questions before the interview in order to reduce the participants' anxiety. Secondly, the researcher elicited prior knowledge of learning and writing in English. Thirdly, the researcher asked three questions as follows.

Question 1: "What problems do you confront when writing in English? (Spelling, organization, idea, vocabulary, grammar)?"

Question 2: "What strategies do you use to overcome these problems?"

2.1 What strategies do you use to overcome these problems during the pre-writing stage? (Planning): (Generating, organizing, goal setting, memorizing)

2.2 What strategies do you use to overcome these problems during while-writing? (Translating: Generating pretext and generating texts)

2.3 What strategies do you use to overcome these problems during post-writing? (Reviewing: Evaluating, Editing)

Question 3: "Does a mind map help you to write in English? How? (Organization of paragraph writing, vocabulary, and creativity of writing)?"

4. Documentary Data

Aiming to examine the link between mind map strategies and L2 writing development of the participants, the final written products, which six participants produced in paragraphs of six different topics, a total of 36 written products were collected. The final written products were assessed for the EFL learners' L2 writing development as they were introduced to the writing process and scaffolding from peers and teachers by three

people, including the researcher and two English teachers (a Thai teacher and a native speaker teacher).

5. Attitude questionnaire

The Attitude questionnaire was modified by Kamli (2019) to study students' attitudes toward using a mind map to enhance L2 writing before and after the treatment. This attitude questionnaire covered the concepts of enjoyment (5 items), ease (5 items), competence/ability (5 items), and strategy used to write (5 items) as shown in Appendix C. There were 20 Likert scale items in total. The scale had options ranging from 1 (strongly disagree) to 5 (strongly agree). The questions include 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.

Data Analysis

1. SPSS Program for Windows

The means and standard deviation were used to analyze quantitative data using attitude questionnaires to determine the students' writing quality and opinions about learning writing through a mind map according to an observation checklist. Moreover, the paired t–test was used to collect quantitative data to compare the students' abilities to write descriptive paragraphs before and after using a mind map.

2. The Content Analysis

The qualitative data from the semi–structured interview were analyzed using the content analysis method which analyzes the students' attitudes towards using a mind map by coding and categorizing into themes grouping similar answers.

3. Microgenetic Analysis of the Participant Observation

The microgenetic analysis focuses on the EFL students' cognitive processes during the writing activities, reflected through the participants observations. After conducting

the audio recordings and transcribing the oral language data from the observations, the Microgenetic analysis was conducted. The EFL students' utterances involving their writing behaviors and their thinking processes from pre-writing, while-writing, and post-writing. The analytical framework for the microgenetic analysis was classified using Flower and Hayes' cognitive process theory of writing, as shown in Appendix D. In the microgenetic analysis, the researcher analysed the spoken language data line by line to investigate the thinking processes during the L2 writing activities.

According to Appendix D, in the research question 1, the written products were used to collect quantitative data to evaluate EFL students' writing abilities before and after using a mind map. Additionally, in the research question 2, the participant observation (Audio recording) was used to collect qualitative data to observe the participants' behavior and special events of cognitive processes that the different proficiency EFL students used through writing activities.

4. The Ethical Approval

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. The process for obtaining written consent from the student volunteers was made public relations to the participants before studying the Fundamental English course. In addition, the volunteers were asked to read the information sheet before signing the consent forms. According to the ethical approval, the volunteers had the right to withdraw from this study at any time.

5. Reliability and Trustworthiness of the Data

To ensure the *reliability* of the data, the instruments of this study, including the pretest, the posttest, and the attitudes questionnaire were checked by three experts to clarify the Item-Objective Congruence (IOC) or Content Validity. After the experts checked the instruments, the researcher revised the instruments according to the suggestions from the experts.

Regarding the consistency and reliability of the qualitative data from the semi-structured interview and the participant observation, this study was conducted and used multiple triangulation methods, including documentary data (final written products),

semi–structured interviews (6 EFL students), and participant observations (6 EFL students). Thus, conducting this study by using the triangulation method can encourage the researcher to generate reliable evidence (Cohen et al., 2007).

CHAPTER IV

RESULTS

This study was conducted to examine the effects of using a mind map on EFL students' L2 writing development. Moreover, this study aimed to investigate the links between using a mind map and L2 writing development while EFL students are engaged in writing processes. The findings from the two research questions are presented in this chapter, divided into two main sections. First, section 1 involves the students' descriptive writing activities before and after using a mind map, and section 2 reveals the students' opinions about learning writing through a mind map. The findings from these analyses have been presented in light of the following research questions. Research Question 1 is "what are the effects of using a mind map on EFL students' L2 writing development?", and Research Question 2 is "what are the students' perceptions on the relation of using a mind map and L2 writing development while EFL students are engaging in writing processes?"

To answer the research questions, this chapter presents the quantitative data and qualitative data as follows:

1. The Results of Research Question 1: What are the effects of using a mind map on EFL students' L2 writing development?

1.1 L2 Writing pre-test and post-test: quantitative data

1.2 L2 Writing pre-test and post-test: qualitative data

1.3 The EFL students' writing strategies during the use of mind maps

1.4 The Effects of using mind maps on EFL students' L2 writing development

2. The Results of Research Question 2: What are the students' perceptions on the relation of using a mind map and L2 writing development while EFL students are engaging in writing processes?

2.1 EFL students' attitudes towards using a mind map

2.2 The EFL Students' English writing difficulties

2.3 The EFL students' perceptions towards using mind maps during L2 writing activities

The following sections show the results of the data analysis that was used to answer each research question.

The Results of Research Question 1: What are the effects of using a mind map on EFL students' L2 writing development?

The objective of the first research question was to compare the EFL students' L2 writing development before and after learning through a mind map to highlight the enhancement of students' writing abilities after the implementation. The results of this section were separated into two parts. The first part represented the students' writing ability test scores before and after learning through a mind map. The second part described the findings of the students' attitudes toward using a mind map to improve L2 writing before and after treatment. Examples of the students' descriptive paragraph writing ability pre and post-illustrated were also provided.

1 L2 Writing Pre-test and Post-test: Quantitative Data

The section shows how the students' writing test scores increased before and after they used mind maps to enhance their writing skills. The descriptive statistics for the means and standard deviation were used to determine the mean English writing skills of 12th graders on the pre-test and post-test. Then, the experimental group's mean scores on the writing pretest and posttest were compared using a paired t-test to determine how well the pre-writing activities enhanced Thai EFL students' performance in writing.

The analysis of the paired t-test on the pretest and posttest mean scores revealed a statistically significant difference between the pretest and posttest mean scores of the experimental group students.

Table 1 A comparison between the overall means of the pre-test and post-test scores of L2 writing

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

Note: *Significance level of 0.05 ($p<.05$)

Table 1 shows that the Thai EFL students who used mind maps did better on their English writing tests after using mind maps than before. Before the test, the mean and standard deviation (SD) for EFL students were 14.30 and 2.04, respectively. On the other hand, these EFL students' post-test scores ($\bar{X}$) 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 descriptive paragraph writing activities. A comparison of the mean scores from the pre-and post-tests reveals the tests' highly significant results (0.00). The findings of this study demonstrated a significant increase in comparing post-test to pretest scores on these EFL students' English written products of descriptive paragraph writing. In brief, using a mind map during English writing activities seems to enhance the EFL students' L2 writing development, as indicated by the higher post-test results.

2. L2 Writing Pre-test and Post-test: Qualitative Data

Table 2 Samples of advanced EFL students' English written products

The tests	Writing performance	Coding	Sample of the students' written products (See appendix p.110-111)
	Advanced EFL student A1: Vocabulary		
Pretest	-Inappropriate non-capitalized letter	S1	● *it* will be the most rewarding and fun life.
Posttest	-Appropriate capitalization	S2	● *In* the morning, Dra takes us back to the dormitory.
	Advanced EFL student A2: Vocabulary		
Pretest	-Inappropriate word use ['finish' should be 'finishing']	S3	● After finish lunch we go to class as usual.
Posttest	-Appropriate word use	S4	● After entering the row we go to school as usual.
	Advanced EFL student A1: Organization		
Pretest	-Confusing order of ideas [restate the topic sentence before concluding sentence]	S5	● How many obstacles will there be?
Posttest	-Well-organized body and flow logically	S6	● Good morning..., And the next period until lunch break..., After finishing..., In the evening...
	Advanced EFL student A2: Organization		
Pretest	-Lack of concluding sentence	S7	● After finish lunch we go to class.. I returned to my home. [end of the paragraph]
Posttest	-Paragraph contains a concluding sentence	S8	● One day in my school I met many people... made us enjoy learning.

According to Table 2, the advanced EFL students seem to be able to develop their L2 writing abilities regarding using appropriate capitalization, well–organized sentences, and concluding sentence. Student A1 was able to write the appropriate capital letter 'In the morning' (S2) in the posttest. In addition, the student A2 also appeared to develop her vocabulary use after preposition 'after entering' (S4).

Table 3 Samples of intermediate EFL students' English written products

The tests	Writing performance	Coding	Sample of the students' written products (See appendix p.112–113)
	Intermediate EFL student I1: Vocabulary		
Pretest	–Misspelling words	S1	● I work up in the morning, I washed my face..., *god dressed* until 6:20...
Posttest	–Correct word spelling	S2	● I woke up at 05:30 then I *got to take* a shower.
	Intermediate EFL student I2: Vocabulary		
Pretest	–Inappropriate word use	S3	● After finishing the line, I *went up* to study...
Posttest	–Appropriate word use	S4	● Yesterday I *woke up* at 6 am,..
	Intermediate EFL student I1: Organization		
Pretest	–Unwell–organize paragraph	S5	● I woke up in the morning... After that... After that.. After finishing the class.. [1 paragraph with 14 lines]
Posttest	–Well–organized body and flow logically	S6	● On the bright Wednesday morning... When I arrive at school.. After that... [3 paragraphs with 3 supporting details – 17 lines]

Table 3 (cont.)

The tests	Writing performance	Coding	Sample of the students' written products (See appendix p.112–113)
	Intermediate EFL student I2: Organization		
Pretest	–Limited details	S7	● In the morning... Then... After finishing the line.. At noon... [1 paragraph with 6 lines]
Posttest	–Well–organized body and flow logically	S8	● Yesterday I woke up at 6 am... I go to school ... In the morning... At noon... At 4 pm... [3 paragraphs with 15 lines]

Table 3 shows that the intermediate EFL students appeared to develop their descriptive paragraph writing regarding correct word spelling, appropriate word use, and well–organized paragraph. Student I1 was able to spell the word 'got' correctly (S2), and Student I2 was able to appropriately use the preposition 'up' in 'woke up'. Regarding paragraph organization, Student I1 could write a paragraph with a well–organized body and flow logically. Similarly, Student I2 seemed to develop his L2 writing abilities by writing well–organized paragraphs, clear supporting details, and three supporting paragraphs.

Table 4 Samples of beginner EFL students' English written products

The tests	Writing performance	Coding	Sample of the students' written products (See appendix p.114–115)
	Beginner EFL student B1: Vocabulary		
Pretest	–Ungrammatical word use	S1	● Today *I'm wake up* in the morning...
Posttest	–Correct grammatical words	S2	● ...the activity *I'm participating* in...
	Beginner EFL student B2: Vocabulary		
Pretest	–Inappropriate word use	S3	● I woke up around 6:30 and *came to* school...
Posttest	–Appropriate word use	S4	● I *go to* class...
	Beginner EFL student B1: Organization		
Pretest	–Paragraph lacks of conjunctions and lacks of a clear focus	S5	● Today I'm wake up in the morning, I'm brush.., I'm come to school... I and my friends go to class...
Posttest	–Paragraph lacks of conjunctions and lacks of a clear focus	S6	● one day in school,... My favorite subject is..
	Beginner EFL student B2: Organization		
Pretest	–Paragraph lacks of conjunctions and lacks of a clear focus	S7	● I woke up around 6:30 ... To day I have...
Posttest	–Paragraph lacks of conjunctions and lacks of a clear focus	S8	● I go to school by.. I was eating with.. start studying class..

Table 4 revealed the beginner EFL students' L2 writing development after using mind maps to enhance their English vocabulary development and paragraph writing. After using mind maps, Student B1 seemed to improve her vocabulary use regarding correct grammatical use 'I'm participating' (S2), and Student B2 also showed appropriate word use 'I go to...' (S4). Regarding writing organization, the results show that both Student B1 and Student B2 seemed to be less successful in writing organization. The final written

texts show that Student B1 and B2 could write a short paragraph which lacked of conjunctions and clear focus (S6 and S8).

3. The EFL Students' Writing Strategies during the Use of Mind Maps: Qualitative Data from the Semi-structured Interview

To elicit EFL students' writing strategies while participating in pre-writing activities using mind mapping, they were asked, "What strategies do you use to overcome these problems?" EFL students were asked to plan a paragraph writing with their peers during the pre-writing activities. Mind mapping was used as a writing model at this stage to help students generate ideas, organize ideas, and set goals. The analytical framework for writing strategies was adapted from Flower and Hayes (1981) and Moqbali et al. (2020).

Table 5 EFL students' writing strategies during pre-writing stage

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

According to Table 5, EFL students reflected on their writing strategies during using mind maps to enhance English writing abilities in the pre-writing stage by using translation, memorization, and asking peers. To plan paragraph writing, the advanced EFL students prepared their English vocabulary knowledge by translating and memorizing and asking peers for assistance (A1 and A2). Regarding the intermediate EFL students, they emphasized English vocabulary knowledge by retrieving and memorizing vocabulary (I1 and I2). For beginning EFL students, they used Google Translate to convert words from their native language to English (B1 and B2).

During the while-writing stage, the EFL students were required to transform ideas from their mind maps into English descriptive paragraphs. These students were interviewed to discuss the writing process and how they utilized writing strategies to improve their writing skills at this stage.

Table 6 EFL Students' Writing Strategies during the while-writing stage

Participants	Statements	Coding	Writing strategies during while-writing process
Advanced EFL students	●*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 students	●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 the content.	I2	-Asking the teacher and peers
Beginner EFL students	●*Search* for words using Thai and some English. I enjoy *writing with friends* in groups since the responsibilities have been shared.	B1	-Searching words -Writing with peers
	●Examine and compare online examples of sentence construction.	B2	-Constructing sentences

According to Table 6, EFL students utilized writing strategies to search for English words, learn to write with peers, translate English vocabulary, and construct English sentences. While writing English paragraphs, the advanced EFL students revealed that they searched for English words (A1) and translated them (A2) using a thesaurus. Regarding intermediate EFL learners, they reported using the following paragraph writing strategies: searching the Internet for words (I1), writing with peers (I1), and consulting the teacher and peers while revising the paragraph (I2). The novice EFL students then searched for words, wrote with peers (B1), and constructed sentences (B2). In conclusion, the while-writing stage writing strategies included searching for words, translating the words, and writing with peers.

The EFL students were asked to review and evaluate their paragraph writing with their peers during the post-writing stage. Individuals were asked to revise the descriptive paragraph by themselves at the end. Following the writing stage, students were interviewed about the writing strategies that they used during engaging in the post-writing stage.

Table 7 EFL Students' Writing Strategies during Post-writing stage

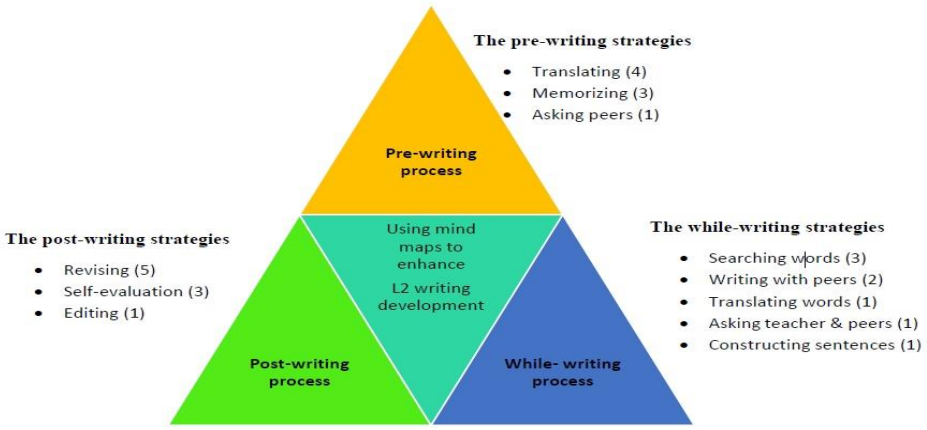
Participants	Statements	Coding	Writing strategies during post-writing process
Advanced EFL students	•I *double-checked* the writing and the wording on the *self-evaluation* form provided by the teacher.	A1	-Revising -Self-evaluating
	•It is easy for me to *edit* writing individually following the *self-evaluation* checklist.	A2	-Editing -Self-evaluating
Intermediate EFL students	•*Review and verify* the words once again.	I1	-Revising
	•I *revise* the first sentence to the end.	I2	-Revising

Table 7 (cont.)

Participants	Statements	Coding	Writing strategies during post-writing process
Beginner EFL students	•I like to *evaluate my writing* with my peers.	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 7, the EFL students utilized writing strategies in the forms of revision, self-evaluation, and editing to review their descriptive paragraph writing during the post-writing stage. In the final stage of writing, the advanced EFL students reported that they engaged in self-evaluation of their writing (A1 and A2), revision (A1), and editing (A2) of their descriptive paragraph writing. For intermediate EFL students, revising (I1 and I2) was necessary to complete their writing. Regarding EFL beginners, they engaged in self-evaluation (B1) and revision (B2) with the instructor and peers. In conclusion, these EFL students preferred to revise their paragraphs before completing them.

As can be seen, that the EFL students attempted to use writing strategies while using mind map to enhance L2 writing development. Figure 4.1 shows a summary of the results that most EFL students used translating strategy in the pre-writing stage, searching words in the while-writing stage, and revising in the post-writing stage.

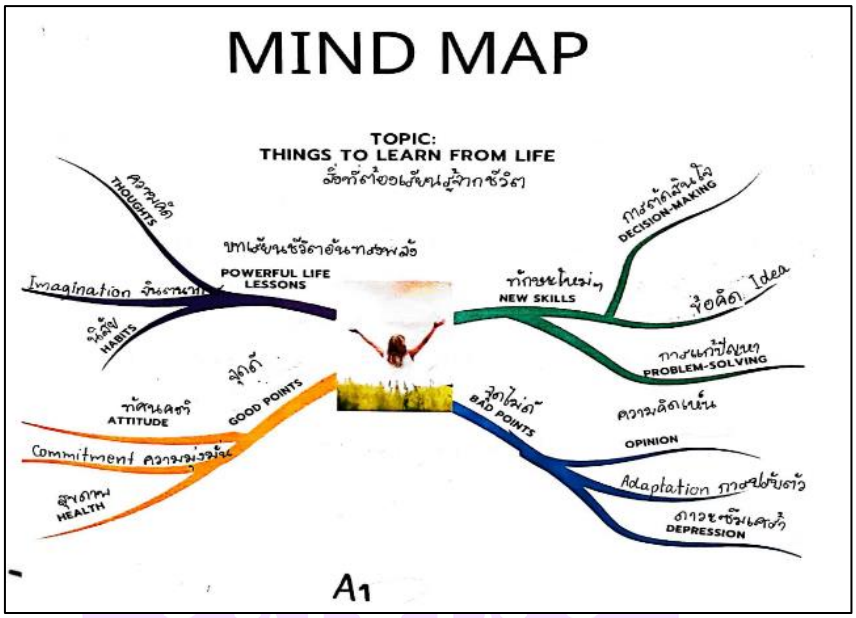


Figures 4 The summary of writing strategies used by the EFL students

4. The Effects of Using Mind Maps on EFL Students' L2 Writing Development: Qualitative Data from the Participant's observation

4.1 The Effects of Using Mind Maps on Advanced EFL Students' L2 Writing Development

Excerpt 1 illustrates how two advanced EFL students learned to write through the use of mind mapping. In this excerpt, the EFL students were assigned to write a descriptive paragraph writing under titled "Things to learn from life". At the pre–writing stage, these EFL students engaged in a planning process by generating, organizing ideas, and setting a goal to write the given topic. In this stage, the students attempted to write the descriptive paragraph by transferring ideas from a mind map that they created by themselves into a well–organised descriptive paragraph.



Figures 5 Student A1's mind map

A1

Our life is always full of lessons. Some people can learn life lessons through their own experiences, but many people learn from others. And this is a wonderful life lesson. That can help us develop ourselves in an incredible way.

My life is full of complexity. and powerful life lessons I manage my life by planning, divided into 4 main themes: 1. Life Lessons with 3 factors: thoughts, imagination, habits 2. New skills are divided into 3 main factor: decision-making, ideas, and problem-solving. 3. Bad points are divided into 3 factors: opinions, adaptation depression, and 4. Good points are divided into 3 factors: Attitude commitment, Health. All of these I have tried for myself and the results. It turned out well, so I want to share some good skills that everyone can actually do.

Figures 6 Student A1's descriptive paragraph

Table 8 Excerpt 1: The advanced EFL students' learning to write by using a mind map

Moves	Dialogues	Cognitive processes	Samples of L2 written productions
1	A1: How to write the word *'powerful'* in English?	• Generating ideas to write an English word	"My life is full of complexity and *powerful* life lessons..."
2	A2: How do we get this word? Hh... What is it? I have to memorize. Confuse this point.		
3	A1: I am starting to write now. What is the English vocabulary? Ok, no need. I'm in a hurry to write.	• Setting a writing goal • Generating ideas	–
4	A2: No, I'm still thinking. I got 2 words.		
5	A1: How to start writing? What kinds of English vocabulary that I have to write? Do you start to write a paragraph? How can I write an introduction? We can write whatever, right? There are good points and bad points, own thoughts, environment, good habits, commitment, and good problem-solving.	• Planning to write • Generating ideas to search for English words • Organizing ideas and organizing a paragraph writing	–
6	A2: Do you finish planning? I'm going to start writing now. Do we have to write all these words [in the mind map]? What is this? Good points and bad points?		
7	A1: How to write the word *'therefore'* in English?	• Translating Thai (L1) word to English (L2) word	"It turned out well, *so* I want to share some good skills..."

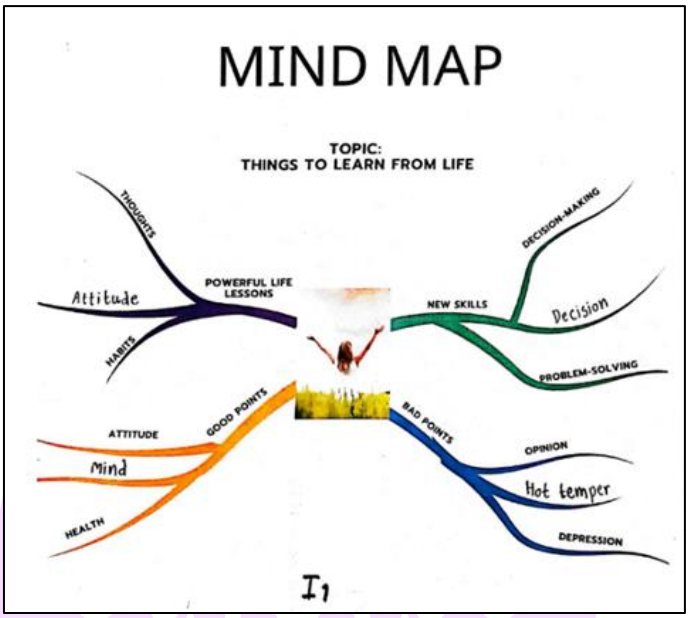
Table 8 (cont.)

Moves	Dialogues	Cognitive processes	Samples of L2 written productions
8	A2: I'm writing.		
9	A1: I write like this. Can I write a long paragraph like this? I can only write some of the points. I finished writing now.	• Evaluating own writing	

The excerpt above revealed how the advanced EFL students attempt to write English by transferring ideas from the mind map into a descriptive paragraph. Student A1 started to organize his ideas to write an English word "powerful" (move 1). Following this learning process, the student attempted to set a goal for writing and generate ideas for necessary English words again (move 3). Interestingly, Student A1 talked to the peer and talked to the self to plan writing, generate, and organize ideas for writing (move 5). While writing, student A1 sought for translating technique to write for writing an unfamiliar English word 'therefore'. At the end of this excerpt, Student A1 engaged in self–evaluation after completing the descriptive paragraph (move 9). In brief, Student A 1 learned to write a descriptive paragraph in English through the use of a mind map to generate ideas, set the writing goal, plan and organize a paragraph, translate ideas, and evaluate the self.

4.2 The Effects of Using Mind Maps on the Intermediate EFL Students' L2 Writing Development

In this session, the intermediate EFL students I1 and I2 learned to write a descriptive paragraph under the topic "Things to learn from life". The excerpt below showed how Student I1 tried to solve writing problems and used the mind map to help her English writing ability. In this context, Student I1 asked and shared with the peer how to write the descriptive paragraph together with the mind map for planning and organizing ideas before writing.



Figures 7 Student I1's mind map

I1

THINGS TO LEARN FROM LIFE

What we have to learn from life is the lessons we will face in the future. Whether it's new skills, including our good points and bad points.

There are many lessons in life that we have to learn in the future. Attitudes, thoughts, quirks, we all need to live to meet new skills such as decision-making, planning and problem solving.

Finally, both lessons and life skills have advantages and disadvantages that differ depending on what we use and what we can improve.

Figures 8 Student I1's descriptive paragraph

Table 9 Excerpt 2: The intermediate EFL students' learning to write by using a mind map

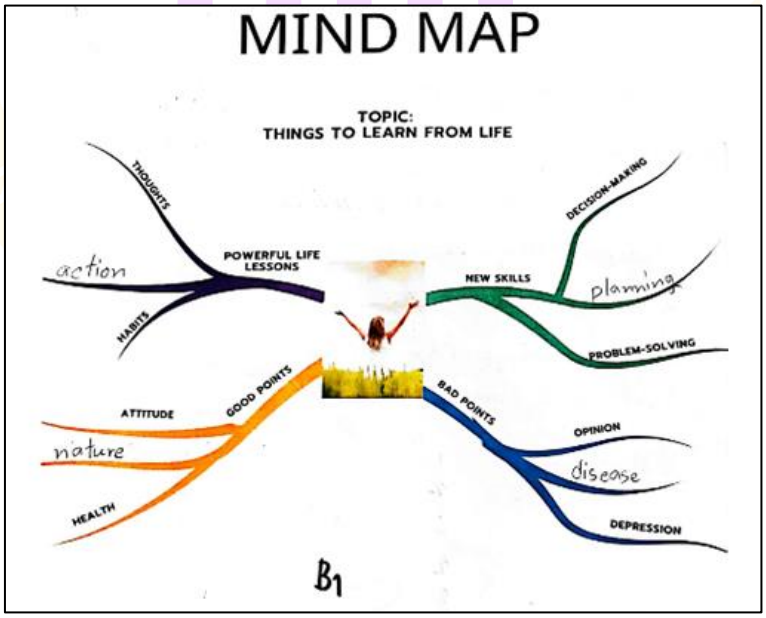
Move	Dialogues	Cognitive processes	Samples of L2 written productions
1	I1: How to write *'planning'* in English?	• Generating an idea to write English vocabulary	"Attitudes, thoughts, quirks, we all need to live to meet new skills such as decision–making, *planning* and problem solving."
2	I2: [I2 did not answer and talk to the teacher]		
3	I2: How to write the name?		
4	I1: We will write sentences first.	• Setting a goal to write sentences	
5	I2: We have to write our own sentences, right?		
6	I1: Yes.		
7	I2: Can I see your topic?		
Excerpts 2 (cont.)			
8	I1: I will use vocabulary from the mind map.	• Transferring ideas from the mind map into written texts.	'new skills', 'good points', 'bad points', 'attitude', 'decision–making', 'problem–solving'
9	L2: We have to write sentences under the mind map.		
10	I1: 'Life lesson'.... Should plan... We should write like this, right?	• Generating ideas to write a sentence	"What we have to learn from *life* is the *lessons* we will face in the future."

As shown in Excerpt 2, the intermediate EFL students participated in the English writing activities after drawing a mind map as a model for paragraph writing. After looking at the mind map, Student I1 attempted to generate ideas to write the English word

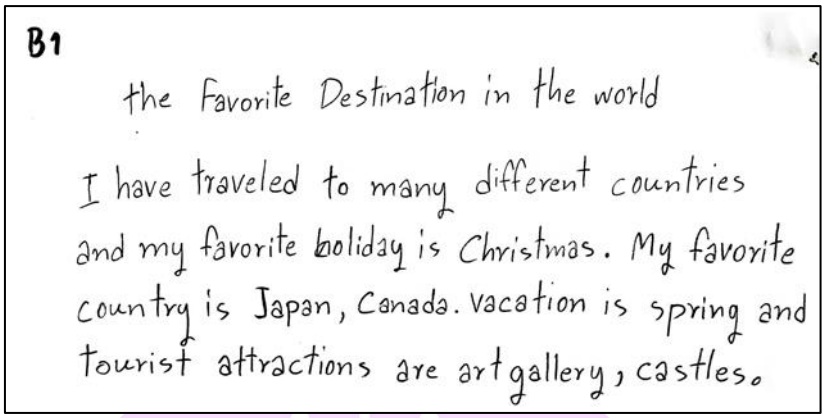
'planning' (move 1). After gaining the idea to write the target word, Student I1 continued to set a goal to write a paragraph, stated from constructing English sentences (move 4). After that, the student planned to translate ideas by using the English vocabulary planned in the mind map to write English sentences. At the end of this excerpt, Student I1 generated ideas to write key words from the mind map again. Thus, the intermediate EFL student learned to write descriptive paragraph after planning ideas in the mind map, then the student engaged in generating ideas, set a goal to write, and translate ideas from the mind map.

4.3 The Effects of Using Mind Maps on Beginner EFL Student' L2 Writing Development (B1)

In session 5, the beginner EFL student B1 was asked to write a descriptive paragraph writing. The given topic was "Things to learn from life". Before writing the descriptive paragraph, the student B1 created the mind map to plan and organize ideas, then this EFL student wrote the descriptive paragraph based on the ideas planed and organized in the mind map. The dialog in Excerpt 3 below shows the student B1's thinking processes employed during the writing activities.



Figures 9 Student B1's mind map


B1

the Favorite Destination in the world

I have traveled to many different countries and my favorite holiday is Christmas. My favorite country is Japan, Canada. vacation is spring and tourist attractions are art gallery, castles.

Figures 10 Student B1's descriptive paragraph

Table 10 Excerpt 3. The beginner EFL students' learning to write by using a mind map

Move	Dialogues	Cognitive processes	Samples of L2 written productions
1	B1: How to write this word? I didn't plan it before. Teacher? Can I write '*powerful life lessons*' now?	• Generating ideas for English vocabulary	"There are many things to learn from life, such as powerful lessons, habit actions, ..."
Excerpt 3 (cont.)			
2	B2: Try to plan [a mind map] coherently.		
3	B1: Nearly finished? Wait. Why don't you write first?	•Evaluating the peer's writing. • Suggesting peer	
4	B2: How to write the word 'mental' in English?		
5	B1: How to write 'solve problems'?	• Generating ideas for writing problem-solving	""There are many things to learn from life, such as powerful lessons, ..., *problem-solving*, decision-making."

Table 10 (cont.)

Move	Dialogues	Cognitive processes	Samples of L2 written productions
6	B2: Just look at the red branch [vocabulary in the mind map].		
7	B1: How come I can't start writing? We have to reorder the words in the first paragraph first, right? Ah... how to write this one and rewrite it again. OK, I'm going to write it now.	• Self-evaluating writing • Organizing ideas for writing • Goal setting to write	
8	B2: Should we start a new sentence?		
9	B1: Should we start the first paragraph?... OK, we start to discuss each other understanding.	• Organizing paragraph writing	

In Excerpt 3, the beginner EFL student engaged the dialogue to write a descriptive paragraph by planning and organizing ideas in the mind map and transferring the ideas into paragraph writing. As can be seen, the EFL students deployed the cognitive processes for writing by generating ideas for writing English words (move 1, move 5, move 7, move 9), evaluating her own writing (move 7), and setting the goal to start writing (move 7). In sum, the mind map appeared to enhance the beginner EFL students to concrete on her English paragraph writing through the cognitive processes of generating ideas, self-evaluating, and setting writing goal.

The Results of Research Question 2: What are the students' perceptions on the relation of using a mind map and L2 writing development while EFL students are engaging in writing processes?

The main questions posed by the interviewer were used to extract information from the interview. The questions were organized into three major themes that the researcher adapted from Kamli's (2019) previous research study: (i) problems encountered when writing in English, (ii) strategies used to overcome the problems, and (iii) a mind map that aids in writing in English. Differences in experience were discovered between six different proficiency EFL students within these three themes.

1. EFL students' attitudes towards using a mind map to improve their English writing development: Quantitative Data from the Attitude Questionnaire

This section presents the findings from 30 EFL students who used mind maps during descriptive writing activities to enhance their L2 writing development in terms of enjoyment, ease, writing ability, and strategy use. After the final session of this research, 30 EFL students were asked to reply to this attitude questionnaire which was adopted from Kamli (2019). The data interpretation is presented according to five Likert scales questions, 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).

Table 11 The EFL students' enjoyment attitudes towards using a mind map on their L2 writing development

No.	Statements	$\bar{X}$	S.D.	Interpretation
Enjoyment				
1.	I enjoyed constructing a mind map.	3.60	0.50	Agree
2.	I enjoyed 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 11 demonstrates that the majority of EFL students agreed that they enjoyed ($\bar{X}$ = 3.73, S.D. = 0.53) to use mind maps when writing descriptive paragraphs in English. As can be seen, the majority of 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). In addition, these EFL students agreed in Item 3 that they "feel relaxed" ($\bar{X}$ = 3.67, S.D. = 0.48) while writing English paragraphs through the use of mind maps. However, the EFL student rated Item 2 as neutral, indicating that they "enjoy solving problems involving circular and rotational motion" ($\bar{X}$ = 3.40, S.D. = 0.50).

Items 6–10 in Table 9 were used to assess EFL students' attitudes towards the ease of using mind maps to help with descriptive writing paragraphs. The results are shown in Table 12 below:

Table 12 The attitudes of EFL learners towards the ease of using mind maps during 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 shown in Table 12, most EFL students agreed that using a mind map can help them write English easily ($\bar{X}$ = 3.91, S.D. = 0.53). Evidently, the EFL students strongly agreed with Item 6 that "it's easy...to write in English" ($\bar{X}$ = 4.27, S.D. = 0.58) when using mind maps during the writing activities. Nonetheless, among the five items, Item 9

was ranked the lowest mean score ($\bar{X}$ = 3.63, S.D. = 0.49) that “it is easy... to get ideas” when they wrote in English.

Items 13 through 15 in Table 10 were used to assess EFL students' competence attitudes towards using mind maps to improve their L2 writing development while participating in descriptive writing activities. The results are presented in Table 10:

Table 13 The EFL students' competence attitudes towards using mind maps during English paragraph writing activities

No.	Statements	$\bar{X}$	S.D.	Interpretation
Using mind maps during writing abilities				
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 13, the overall EFL students strongly agreed that the use of mind maps during writing activities can enhance their descriptive writing performance ($\bar{X}$ = 4.65, S.D. = 0.04). Item 11 and Item 14 were rated equally with the highest mean score ($\bar{X}$ = 5.00, S.D. = 0.00), indicating that respondents strongly agree with the statements in Item 11 they "can understand how to construct a mind map" and Item 14 that they "have discussed a mind map with friends". However, Item 15 received the lowest mean score ($\bar{X}$ = 4.37, S.D. = 0.50) among the five items, in which EFL students believed they received high grades for their English writing.

Table 14, items 16 to 20 were used to evaluate EFL students' attitudes toward the use of mind maps to facilitate their descriptive writing abilities. Table 11 illustrates the results as follows.

Table 14 The EFL learners' attitudes toward learning strategy use of mind maps

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 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**

Table 14 shows that the EFL students strongly agreed ($\bar{X}$ = 4.47, S.D. = 0.50) that using mind maps can help them use strategies more effectively during English paragraph writing activities. Item 20 received the highest mean score from the students, indicating that they "apply what [they] learn to everyday life" ($\bar{X}$ = 4.57, S.D. = 0.50). Moreover, the EFL students also strongly agreed that "a mind map helps [them] to visualize the ideas [they] want to write" ($\bar{X}$ = 4.53, S.D. = 0.51). However, Item 18 had the lowest mean score, indicating that students strongly agreed that when writing in English, they "consider the topic sentences [they] want to use ($\bar{X}$ = 4.30, S.D.= 0.47).

2. The EFL Students' English Writing Difficulties: Qualitative Data from the Semi-structured Interview

To answer the research question, qualitative data from the semi-structured interviews were gathered. The researcher interviewed two advanced, two intermediate, and two beginner-level students. The students' pseudonym codes were A1, A2, I1, I2, B1, and B2. The findings revealed that students with different levels of English proficiency had different attitudes toward the links between using a mind map and L2 writing development. The following is an overview of the EFL students' responses and study findings based on data from the interview.

The qualitative findings from the semi-structured interview are shown in Table 12. Six students were interviewed after engaging in English writing activities using mind maps to improve their descriptive paragraph writing abilities. The interview respondents included two advanced EFL students, two intermediate EFL students, and two beginner EFL students. The interview question "What problems do you have with writing in English?" was asked of the EFL students.

Table 15 EFL students' difficulties in English paragraph writing

Participants	Statements	Coding	Writing difficulties
Advanced EFL students	● "I generally wrote words and utilized the Google Translate application to aid me, 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 students	● "I always use incorrect vowels when writing words."	I1	Mechanic
	● "Some words are hard for me to spell, but using grammar in a sentence is harder."	I2	Mechanic
Beginner EFL students	● "I frequently choose vocabulary inappropriately."	B1	Vocabulary
	● "The sentences are difficult for me to construct correctly."	B2	Organization

Table 15 demonstrates that Thai EFL students struggled with English paragraph writing mechanics, organization, and vocabulary, respectively. As can be seen, advanced EFL students encountered organizational issues when attempting to 'organize sentences' (A2) in English. However, intermediate EFL students struggled with mechanics such as difficulties in vowel use (I1), word spelling, and grammar use (I2). Finally, the beginner EFL students struggled with vocabulary selection (B1) and sentence organization (B2) when writing English descriptive paragraphs. In brief, Thai EFL learners encountered difficulties in

writing English paragraphs regarding selecting appropriate English vocabulary, spelling and grammatical errors, and sentence organization.

3. The EFL students' Perceptions towards Using Mind Maps during L2 Writing Activities

To answer the second research question, "What are the links between using a mind map and L2 writing development during EFL students' writing processes?" "How does a mind map help you write a paragraph in English?" was asked of the students. The semi-structured interviews' qualitative data were transcribed and analyzed in terms of the benefits of mind maps in facilitating vocabulary skills, writing processes, and positive affects.

The Use of Mind Mapping to Facilitate Vocabulary Skills

The EFL students discussed the benefits of mind mapping in helping them improve their vocabulary skills. These Thai EFL students were asked to create mind maps while participating in writing activities to improve their thinking processes in planning the topics, subtopics, keywords, or necessary vocabulary to support the main ideas. Students B1, B2, I1, A1, and A2 reflected on their use of mind mapping to promote their vocabulary skills in the semi-structured interviews.

"Mind maps helped me to understand unfamiliar words easily." (Student A1)

"Mind maps helped me remember vocabulary I have to write in a paragraph". (Student A2)

"Mind maps helped me to understand English vocabulary and memorize it" In addition, "mind maps also motivated to group vocabulary for writing". (Student I1)

"Mind maps helped me to organize vocabulary according to subtopics" (Students B1 and B2)

The examples above demonstrate that using mind maps can improve the vocabulary skills of EFL students in terms of understanding unfamiliar L2 vocabulary, memorizing words before writing, and grouping vocabulary for paragraph organization.

The Use of Mind Mapping to Facilitate Writing Processes

The EFL students reported employing mind–mapping techniques to manage paragraph writing. Mind mapping was used during the pre–writing stage to generate ideas and translate them into descriptive paragraphs. These students expressed that:

Beginner EFL student 1: "Using mind maps helped me to write sentences quickly, write a paragraph concisely, and understand easily." (B1)

Beginner EFL student 2: "Using mind maps helped me to write English sentences and paragraphs quickly." (B2)

The excerpts above revealed that beginner EFL students indicated that using mind maps during the pre–writing stage can assist them in writing sentences and paragraphs quickly, concisely, and easily.

Intermediate EFL student 1: "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." (I1)

Intermediate EFL student 2: "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 onto paper, draw and link my ideas into mind maps." (I2)

According to the excerpts above, the intermediate EFL students said in the interview that mind maps helped them generate, organize, summarize, and transform ideas from mind maps into paragraph writing. Furthermore, 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.

Advanced EFL student 1: "Mind maps helped me write creatively and understandably. Mind maps helped me to think systemically, write effectively, and *understandably*." (A1)

Advanced EFL student 2: "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." (A2)

The excerpts above revealed that for advanced EFL students, mind maps could enhance their ability to think creatively and systematically. Mind maps were used as a tool to enhance abilities to recall prior knowledge, organize ideas and contents, and write English paragraphs easily and coherently.

The Use of Mind Mapping to Promote Positive Results.

During the writing processes, the EFL students had opportunities to create mind maps as a thinking tool to enhance writing abilities. The components of mind maps such as lines, images, codes, and colors can promote students' interests and have positive effects as shown in the excerpts below.

Beginner EFL student 1: "Images and colors in mind maps motivated me in learning to write. Mind maps can increase enthusiasm in English paragraph writing." (B1)

Beginner EFL student 2: "Mind maps motivated me to write, and I want to continue learning." (B2)

Intermediate EFL student 1: "Mind maps motivated me to group vocabulary into each subcategory for writing." (I1)

Advanced EFL student 1 "Mind maps led to motivation in paragraph writing." (A1)

According to the excerpts, the EFL students confirmed that mind mapping can motivate them to write in English and increase their enthusiasm for learning to write.

CHAPTER V

CONCLUSION

This chapter aims to summarize the main findings of this study based upon the research questions include (1) the effects of using a mind map on EFL students' L2 writing development through descriptive writing activities and (2) the EFL students' perceptions on the relation between using a mind map and L2 writing development while they are engaging in writing processes. Lastly, recommendations for a future research study are presented.

Conclusion Research Question 1:

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.

1. The Effects of Using a Mind Map on EFL Writing

The findings of this study indicate that the use of a mind map on EFL is related to the development of students' writing abilities in their second language. The findings of this research indicate that Thai students of English as a foreign language have the potential to achieve higher writing scores after employing the mind map while participating in writing activities. The higher post-test results, which are consistent with the findings of the previous studies, demonstrate that the application of mind mapping is useful for enhancing writing accomplishment and writing performance (Al-Zyoud et al., 2017; Karim & Abu, 2018; Kamli, 2019) as well as the capacity for descriptive writing (Khusniyah, 2019). The findings of the post-test in this current study also correlate very well with a statement made by Al-Zyoud and colleagues (2017, p. 286), which states 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 writing assignments ". In line with a previous study by Alqasham and Al-Ahda (2021), the post-test scores of 40 Saudi EFL students improved after using a concept mind map to

improve their writing skills. The researchers noted 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 current study's premise is based on Pribadi and Susilana (2021), who used mind mapping as a learning strategy to improve primary school students' writing skills. Based on the post-test results, the researchers concluded that using a mind map as a learning strategy can help students in their writing assignments. As a result, Pribadi and Susilana (2021) asserted that using a mind map can assist learners in connecting their prior and current understanding; as a result, "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 studies on using a mind map to improve L2 writing involve university students; this technique is rarely used at the high school level, particularly in Thailand. As a result, this study confirms that using a mind map to teach L2 writing has a significantly progressive effect.

2. Attitudes of Thai EFL Students toward Using Mind Maps to Improve Writing Performance

In terms of writing abilities, strategy use, ease, and enjoyment, the results of the attitude questionnaire showed that most Thai EFL students have positive attitudes toward using mind maps as a learning strategy to facilitate their descriptive writing paragraphs.

First, the findings revealed that Thai EFL students had a very positive attitude toward using the mind map strategy to improve their 'writing abilities' by discussing a mind map with friends while writing descriptive paragraphs. This discovery supports Alquasham and Al-Ahdal's theoretical (2021) claim that “since mind map is a constructivist method of study, it, therefore, follows the concept of social constructivism” (p. 1150). Alquasham and Al-Ahdal (2021) claimed that because the students reflected on collaboration while discussing the topics in groups, “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 questionnaire results revealed that Thai EFL students' positive attitudes toward the use of the mind map strategy can be applied in daily life and can help students mentally visualize the ideas they want to write. This finding is consistent with the findings of Pribadi and Susilana (2021), who found that using mind mapping as a learning approach was effective and "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 evidenced by the benefits of using mind maps, Nidayanti and colleagues (2021) suggested that the mind-mapping technique can motivate students by incorporating multiple media and images into writing instruction. This finding is also related to a study conducted by Luangkrajang (2022), who employed mind mapping in EFL classrooms and found that Thai EFL students had positive attitudes toward its use. By incorporating mind mapping into 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 findings revealed that Thai EFL students demonstrated a positive attitude toward the ease of writing in English when they engaged in writing descriptive paragraphs using mind maps. Similarly, Pribadi and Susilana (2021) discovered that using a mind map learning strategy provides students with "easiness in choosing any correlated themes/ topics to break down" (p. 915). This finding is also related to a study conducted by Sabarun and colleagues (2021), who led the steps to write an expository essay using a mind map, including writing an introduction, selecting a topic, using mind-mapping to select a topic, conducting extensive research, integrating the research using mind-maps, deciding on a structure, creating an outline of the essay using mind-mapping, making a mind map, crafting a thesis statement, beginning drafting the essay, proofreading and editing. Importantly, Sabarun and colleagues (2021) stated that using mind-mapping in choosing a topic can assist writers in providing a topic that is well-known to the writers; thus, the writer can easily write an expository essay. As a result, using a flow mind map influenced learners' writing precision and motivation and contributed to a positive attitude in a writing class (Sabarun et al., 2021).

Fourth, the current study confirmed the findings regarding EFL learners' 'enjoyment' attitudes toward the mind map on their L2 writing development. Thai EFL students reflected on the positive attitude they experienced while using the mind map strategy, particularly the positive affective of excitement while writing in English. According to the evidence, most students enjoyed using mind mapping as it contributed to developing their writing ability, as reflected in the post-test score, which is consistent with the findings of a previous study by Al-Zyoud and colleagues (2017), who established that mind mapping could facilitate students' writing skills. Similarly, Wangmo (2018) discovered that Thai EFL students enjoyed drawing and designing mind maps because it helped them understand what and how to write. As a result, 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). Luangkrajang (2022) recently investigated the use of mind mapping in language teaching and discovered the effectiveness of mind mapping in English classes. According to the researcher, mind mapping can improve students' positive affective domain and allow them to be active learners.

Conclusion Research Question 2:

3. The EFL Students' Writing Strategies during the Writing Processes of Paragraph Writing

The findings confirmed that the EFL students preferred memorizing, translating, revising, and self-evaluating. 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 by using prior knowledge and related information from memorization can lead writers into the text generation stage for "turning ideas into words, sentences, and larger units of discourse within working memory" (Mayer & Alexander, 2017, p. 40).

Regarding *translating 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 Mayer and Alexander (2017), translating ideas into written text involved 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" (Mayer & Alexander, 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 is in accordance with 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 with their writing plan by "reconsidering the argument, reviewing the evidence, refining the purpose, reorganizing the presentation, and reviving stale prose (Abas & Aziz, 2016, p. 175). Consequently, focusing on the revising stage was likely to focus on higher–level features of text and improve their writing quality (Mayer & Alexander, 2022). This evidence in regard to revising strategy also supports the view of Mayer and Alexander (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 themselves during the post-writing stage. Evaluating strategy is identified as a cognitive strategy whereby writers reconsider written text and goals (Mu, 2005, as cited in Hermilinda & Aziz, 2018). 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). This self-evaluating strategy finding is consistent with Moqbali et al. (2020) who revealed that all the students viewed self-evaluation as an effective strategy to evaluate, check their writing clarity and check ideas to clarify the topic. 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).

4. The EFL Students' Use of Mind Maps to Facilitate L2 Writing Abilities

The findings of this study revealed that the EFL students used mind mapping as a writing strategy to facilitate English vocabulary skills, writing processes, and positive attitudes toward English paragraph writing. First, the evidence of using mind maps to promote vocabulary skills is in accordance with 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 them together with new words they had learned. Nodoushan and Maibodi (2017) claimed that using mind maps as a bridging medium can assist Iranian EFL learners in presenting vocabulary more easily 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 using keywords in mind maps will 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 use of the mind–mapping technique could enhance L2 writing development in terms of L2 writing performance and the use of cognitive processes of writing. According to the findings of this current study, mind–mapping techniques can enhance Thai EFL students' ability 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, and generating, and organizing ideas from the mind–mapping technique to transfer these ideas to writing in 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' writing performance. The researchers claimed that the mind mapping technique plays a vital role for ESL writers in promoting the organization of 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 can help students to retrieve gained knowledge and link new information to complete their writing. The study revealed that mind mapping technique can 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 flood out when starting writing" (Pribadi & Sasilana, 2020, p. 915).

Third, this study's findings uncovered that using mind maps can facilitate the EFL learners' positive attitudes such as motivation and enthusiasm. Thai EFL learners revealed that mind–mapping techniques can motivate them to group vocabulary and ideas, learn English writing, and increase their enthusiasm for learning to write. This finding supports the results of Vejayan and Yunus (2022) which revealed that digital mind–mapping applications can enhance learners' affective aspects of feeling happy and motivated when they used the mind–mapping technique to guide their writing and facilitate their ideas for writing. A study conducted 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.

Recommendations

Based on the findings from this research study, the recommendations are offered as follows.

1. The purpose of this study was to investigate how the development of a mind map can help students improve their writing ability in the form of descriptive paragraph writing. Therefore, it will be beneficial to find out whether the use of the same or different techniques with students' ability to write other types of writing such as expository, persuasive, journal or letter writing, etc. has the same or different results. This can be beneficial because it will help determine whether the same techniques or different techniques produce the same or different results.

2. To learn more about how descriptive paragraph writing can help improve multiple language skills, it will be helpful to do research that combines other language skills, like writing, reading, listening, and speaking, in different ways.

BIBLIOGRAPHY

Abas, I. H. and Aziz, N. H. A. (2016). Classification of L2 Writing Process and Writing Strategies. In International Seminar on Generating Knowledge Through Research (pp. 367–380). Malaysia: Universiti Utara Malaysia. Retrieved March 3, 2022, from doi: 10.21070/picecrs.v1i1.505.

Abhakorn, J. (2019). EFL Education Policy Implementation: A Look at English Classroom Instructional Focuses. NIDA Development Journal, 59(1), 76–97.

Ahmed, R. M. (2020). Investigating EFL Learners' Awareness of Cognitive and Metacognitive Reading Strategies of Students in Different Disciplines. Arab World English Journal (AWEJ), 11(3), 294 –304. Retrieved March 3, 2022, form DOI: https://dx.doi.org/10.24093/awej/vol11no3.18

Agustiana, V. (2016). Combining product and process based–approaches to teaching writing discussion texts. English Review, 4(2), 195–208.

Ahmad, S., Hussain, C. A., Ayesha, B., Khadija, S. and Misbah, M. (2016). Play and Cognitive Development: Formal Operational Perspective of Piaget's Theory. Journal of Education and Practice, 7(28), 72–79.

Alahmadi, N. S. (2020). The Effect of the Mind Mapping Strategy on the L2 Vocabulary Learning of Saudi Learners. Education and Linguistics Research, 6(1), 54–68. Retrieved March 3, 2022, from Doi: 10.5296/elr.v6i1.16425

Al–Bataineh, A. (2010). The Effect of the Internet on Improving Foreign Language Students' Writing Performance. An–Najah Univ. J. of Res. (Humanities), 24(4), 1241–1258.

Aliyu, M. M., Yong, M. F., Abdullah, M. H. and Hoon, T. B. (2016). Developing undergraduates' awareness of metacognitive knowledge in writing through problem–based learning. International Journal of Applied Linguistics & English Literature, 5(7), 233–240. Retrieved March 3, 2022, from doi: 10.7575/aiac.ijalel.v.5n.7p.233.

Al Kamli, H. M. (2019). The Effect of Using Mind Maps to Enhance EFL Learners' Writing Achievement and Students' Attitudes Towards Writing at Taif University. Arab World English Journal, 1–92. Retrieved March 3, 2022, from doi:10.24093/awej/th.232

Al-Naibi, I., Al-Jabri, M. and Al-Kalbani, I. (2018). Promoting Students' Paragraph Writing Using EDMODO: An Action Research. The Turkish Online Journal of Educational Technology, 17(1), 130-143.

Alqasham, F. H., and Al-Ahda, A. A. M. H. (2021). Effectiveness of mind-mapping as a digital brainstorming technique in enhancing attitudes of Saudi EFL learners to writing skills. *Journal f Language and Linguistic Studies,* 17(2), 1141–1156.

Al-Sobh, M. A. and Al-Abed Al-Haq, F. (2012). Online linguistic messages of the Jordanian secondary students and their opinions toward a web-based writing instructional EFL program. International Journal of Humanities and Social Science, 2(6), 288-299.

Al- Zyoud, A. A., Al Jamal, D. and Baniabdelrahman, A. (2017). Mind Mapping and Students' Writing Performance. Arab World English Journal, 8(4), 280–291. Retrieved March 3, 2022, from https://dx.doi.org/10.24093/awej/vol8no4.19

Amjah (2014). A study of teachers' strategies so develop students' interest towards learning English as a second language. Procedia-Social and Behavioral Sciences, 134, 188–192.

Anh, D. T. N. (2019), EFL Student's Writing Skills: Challenges and Remedies. Journal of Research & Method in Education, 9(6), 74-84. Retrieved April 26, 2020 from https://www.iosrjournals.org.

Araujo, R. C. (2019). Collaborative mind mapping to support online discussion in teacher education. (Doctoral dissertation). *The University of Western Ontario.* Retrieved June 2, 2020 from https://ir.lib.uwo.ca/etd/6561

Arici and Kaldirim (2015). The Effect of the Process-based Writing Approach on Writing Success and Anxiety of Pre-service Teachers. Anthropologist, 22(2), 318-327.

Arulselvi, E. (2017) Mind maps in classroom teaching and learning. The Excellence in Education Journal, 6(2), 50-65.

Aslanoğlu, A. E. (2021). Examining the Differential Rater Functioning in the Process of Assessing Writing Skills of Middle School 7th Grade Students. Participatory Educational Research (PER), 8(4), 239-252. Retrieved March 3, 2022, from https://doi.org/10.17275/per.21.88.8.4

Atkinson, D. (2011). Alternative approaches to second language acquisition. Abingdon, UK: Routledge. Journal of Language, 12, 152–159, Retrieved March 3, 2022, from doi: 10.1080/15348458.2013.775885

Atkinson, D. (2018). Theory in Second Language Writing. The TESOL Encyclopedia of English Language Teaching, 2–6. Retrieved March 3, 2022, from doi: 10.1002/9781118784235.eelt0524.

AS'ARI, A. (2016). Using Mind Maps as a Teaching and Learning Tool to Promote. Student Engagement, 9(1), 1–10.

Beetham, H., and Sharpe, R. (2013). Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning. New York: Routledge.

Bhela, B. (1999). Native language interference in learning a second language: Exploratory case studies of native language interference with target language usage. International Education Journal, 1(1), 22–31.

Boonyarattanasoontorn, P. (2017). An investigation of Thai students' English language writing difficulties and their use of writing strategies. Journal of Advanced Research in Social Sciences and Humanities, 2(2), 111–118. Retrieved March 3, 2022, from doi: 10.26500/JARSSH–02–2017–0205.

Brahim, G. (2016). Cognitive Factors Influencing Second Language learning. The Second National Conference on Language, Mind and Learner's Cognitive Capacities. University of Eloued.

Bukhari, S. S. F. (2016). Mind Map Techniques to Enhance EFL Writing Skill. International Journal of Linguistics and Communication, 4(1), 58–77. Retrieved March 3, 2022, from doi: 10.15640/ijlc.v4n1a7.

Buzan, T. (2012). The ultimate book of mind maps. New York, NY: Harper Thorsons.

Carter, K. (2015). Teaching Descriptive Writing through Visualization and the Five Senses. *English Teaching Forum*, 53(2), 37–40.

Castello, M., Banales, G. and Vega, N. (2010). Research approaches to the regulation of academic writing: The state of the question. Electronic Journal of Research in Educational Psychology, 8(3), 1253–1282.

Cho, H. and Brutt-Griffler, J. (2015). Integrated reading and writing: A case of Korean. English language learners, 27(2), 242–261.

Chunling, S. and Guoping, F. (2009). Process Approach to Teaching Writing Applied in Different Teaching Models. English Language Teaching, 2(1), 150-155.

Cohen, L., Manion, L. and Morrison, K. (2007). Research methods in education (6th Edition). London: Routledge.

Common Core State Standards Initiative. (2010). Common core state standards for English language arts & literacy in history-social studies, science and technical subjects. Retrieved September 4, 2010 from http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf.

Davies, M. (2011). Concept Mapping, Mind Mapping and Argument Mapping: What Are the Differences and Do They Matter?. Higher Education, 62, 279-301. Retrieved March 3, 2022, from doi: 10.1007/s10734-010-9387-6.

Devi, K. S. (2019). Constructivist Approach to Learning based on the Concepts of Jean Piaget and Lev Vygotsky An Analytical Overview. Journal of Indian Education, 44(4), 5-17.

Dirgeyasa, I. W., (2016). Genre-Based Approach: What and How to Teach and to Learn Writing. Canadian Center of Science and Education, 9(9). Retrieved March 3, 2022, from doi: 10.5539/elt.v9n9p45.

Dixon, R. and Lammi, M. (2014). Cognitive Mapping Techniques: Implications for Research in Engineering and Technology Education. Journal of Technology Education, 25(2).

Dokchandra, D. (2018). The Effects of Process Writing Approach on Performance of an Overcrowded EFL Writing Class at a university in Thailand, in the 1st Annual International Conference on Language anf literatures, KnE Social Science & Humanities. 161-173. Retrieved March 3, 2022, from Doi: 10.18502/kss.v3i4.1931

Drew, S. V., Olinghouse, N. G., Faggella-Luby, M. and Welsh, M. E. (2017). Framework for disciplinary writing in science Grades 6–12: A national survey. *Journal of Educational Psychology, 109*(7), 935–955. Retrieved March 3, 2022, from https://doi.org/10.1037/edu0000186

Education First. (2016). EF English Proficiency Index (EF EPI). Retrieved February 5, 2020 from http://www.ef.com/epi.

Edwards, R. and Holland, J. (2013). What is qualitative interviewing?. Retrieved January 6, 2019 from http://eprints.ncrm.ac.uk/3276/1/complete_proofs.pdf.

Edwards, S. (2014). Towards contemporary play: Sociocultural theory and the digital–consumerist context. 12(3), 219–233. Retrieved March 3, 2022, from doi: 10.1177/1476718X14538596.

Elashri, I. (2013). The Effect of the Genre–Based Approach to Teaching Writing on the EFL Al–Azhr Secondary Students' Writing Skills and Their Attitudes towards Writing. (Doctoral dissertation), Mansoura University Faculty of Education Department of Methods and curriculum.

Elgamal, A. M. A. (2018). Cognitive Factors Affecting Language Learning and Acquisition of Native and Non–Native Speakers. Journal of Research in Curriculum, Instruction and Educational Technology, 4(4), 135–152.

Eliwarti, E. and Maarof, N. (2014). The Effects of Types of Writing Approaches on Efl Students' Writing Performance. Riau University, Indonesia, 112–119.

Emig. J (1983). The web of meaning. Upper Montclair, NJ: Boynton/ Cook.

Ferris, D. (2002). Treatment of error in second language writing. Michigan: The University of Michigan Press.

Fiktorius, T. (2013). The use of mind–mapping technique in the EFL classroom (Master's thesis). Pontianak: University of TanjungPura, Indonesia. Retrieved March 3, 2022, from doi: 10.21832/9781783095599.

Gabrielatos, C. (2002). EFL writing: product and process. Retrieved August 25, 2019 from http://www.gabrielatos.com/Writing.pdf.

Ganapathy, M. (2014). Using Multiliteracies to Engage Learners to Produce Learning. IJEEEE, 4(6). Retrieved March 3, 2022, from doi: 10.17706/ijeeee.2014.v4.355

Ganapathy, M. (2016). The Effects of Using Multimodal Approaches in Meaning–Making of 21st Century Literacy Texts Among ESL Students in a Private School in Malaysia. Advances in Language and Literary Studies, 7(2), 143–155. Retrieved March 3, 2022, from doi:10.7575/aiac.alls.v.7n.2p.143.

Graham, S. and Sandmel, K. (2011). The process writing approach: A meta-analysis. The Journal of Educational Research, 104(6), 396-407. Retrieved March 3, 2022, from doi: 10.1080/00220671.2010.488703

Graham, S. (2019). Changing How Writing Is Taught. Review of Research in Education, 43(1), 277-303. Retrieved March 3, 2022, from https://doi.org/10.3102/0091732X18821125

Grant, T. (2012). Scenario pedagogy as a negotiated, multimodal approach to developing professional communication practices in higher education. Unpublished doctoral thesis. Cape Town: School of Education, University of Cape Town.

Grant, T. and Archer, A. (2019). Multimodal Mapping: Using Mind Maps to Negotiate Emerging Professional Communication Practices and Identity in Higher Education. South African Journal of Higher Education, 33(1), 74–91. Retrieved March 3, 2022, doi: 10.20853/33-1-2758

Greer, D., Crutchfield, S. A. and Woods, K. L. (2013). Cognitive Theory of Multimedia Learning, Instructional Design Principles, and Students with Learning Disabilities in Computer-based and Online Learning Environments. Journal of Education, 193(2), 41-50.

Griffin, P., McGaw, B. and Care, E. (2012). The Changing Role of Education and Schools. In Assessment and Teaching of 21st Century Skills (pp. 1-16). Dordrecht, Germany: Springer Science+Business Media B.V. Retrieved March 3, 2022, doi: 10.1007/978-94-007-2324-5 2

Hallen, D. and Sangeetha, N. (2015). Effectiveness of Mind Mapping in English Teaching among VIII Standard Students. *Journal on English Language Teaching,* 5(1), 45-50.

Hanewald, R. and Ifenthaler, D. (2014). Digital Knowledge Mapping in Educational Contexts. In book: Digital Knowledge Maps in Education (pp.3-15). Retrieved March 3, 2022, doi:10.1007/9781461431787_1.

Hasan, M. K., and Akhand, M. M. (2010). Approaches to Writing in EFL/ESL Context: Balancing Product and Process in Writing Class at Tertiary Level. Journal of NELTA, 15(1-2), 77-88. Retrieved March 3, 2022, doi: 10.3126/nelta.v15i1-2.4612

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In C. M. Levy & S. Ransdell (Eds.). The science of writing: Theories, methods, individual differences, and applications (pp. 1–27). Mahwah, NJ: Lawrence Erlbaum Associates.

Hayes, J. R., and Flower, L. (1980). Identifying the organization of written processes. In L. W. Gregg, & E. R. Steinberg (Eds.). Cognitive processes in writing (pp. 3–30). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hayes, J. R. and Flower, L. S (1981). A Cognitive Process Theory of Writing. National Council of Teachers of English, 32 (4), 365–387. Retrieved March 3, 2022, doi: 10.2307/356600

Hayes, J. R. and Flower, L. S. (1984). Images, plans, and prose: The representation of meaning in writing. Written Communication, 1, 120–160. Retrieved March 3, 2022, doi: 10.1177/0741088384001001006.

Hayes, J. R. and Flower, L. (2004). A Cognitive Process Theory of Writing. College Composition and Communication, 32 (4), 365–387.

Hermilinda, A. I. and Aziz, N. H. (2018). Model of the writing process and strategies of EFL proficient student writers: A case study of Indonesian learners. Pertanika Journals, Social Sciences & Humanities, 26(3), 1815–1842.

Hinkel, E. (2002). Second language writers' text: Linguistic and rhetoric features, 6(1), Retrieved March 3, 2022, doi: 10.4324/9781410602848

Hofmann, S. G. and Asmundson, G. J. G. (Eds.). (2017). *The science of cognitive behavioral therapy.* Elsevier: Academic Press.

Hyland, K. (2013). Faculty feedback Perceptions and practices in L2 disciplinary writing, Journal of Second Language Writing, 22, 240–253.

Hyland, K. and Hyland, F. (2019). Interpersonal aspects of response: Constructing and interpreting teacher written feedback. In k. Hyland & F. Hyland (eds), Feedback in second language writing (pp. 206–224). Cambridge: Cambridge University Press.

Idrus. F. and Ahmad, I. S. (2020). Processes of Learning English in Academic and Social Setting. Journal of Educational Administration Research and Review, 4(1). Retrieved March 3, 2020, from https://ejournal.upi.edu/index.php/EARR/.

Istikharoh. (2015). Developing interactive multimedia for reading and writing learning materials. UNY Press.

Jackson, Jr. and Eddie, B. (2016). Concept Mapping: Developing Critical Thinking through Mind Mapping (master's thesis). New York: United States Military Academy.

Kao, C. W. and Reynolds, B. L. (2017). A Study on the Relationship among Taiwanese College Students' EFL Writing Strategy Use. Writing Ability and Writing Difficulty. English Teaching & Learning, 31-67. Retrieved March 3, 2022, doi: 10.6330/ETL.2017.41.4.02.

Karim, A. A., Abu, A. G. and Khaja, F. N. M. (2016). Brainstorming Approach Mind Mapping in Writing Activity. Proceedings of the 1 st English Education International Conference (EEIC) (pp. 423-429). Banda Aceh, Indonesia.

Karim. R. A. and Abu. A. G. (2018). Using Mobile-Assisted Mind Mapping Technique (MAMMAT) to Improve Writing Skills of ESL Students. Journal of Social Science and Humanities, 1(2), 01–06. Retrieved March 3, 2022, doi:10.26666/rmp.jssh.2018.2.1

Kaweera, C. (2013). Writing Error: A Review of Interlingual and Intralingual Interference in EFL Context. Journal of English Language Teaching, 6(7), 9-18.

Keles, Ö. (2012). Elementary Teachers' Views on Mind Mapping. International Journal of Education, 4(1), 93-100.

Khudhair, N. K. (2016). The Impact of Applying Mind Mapping Technique as a PreWriting Tool on EFL College Students in Essay Writing. J. Of College Of Education For Women, 27(1), 426-436.

Khusniyah, N. L. (2019). Improving Descriptive Writing Ability through Mind Mapping. Research and Innovation in Language Learning, 2(1), 75–84. Retrieved August 10, 2020, from http://jurnal.unswagati.ac.id/index.php/RILL

Kim, E. (2017). Academic Writing in Korea: Its Dynamic Landscape and Implications for Intercultural Rhetoric. The Electronic Journal for English as a Second Language, 21(3), 1–15.

Kireeva, A. (2019). A MIND MAP: THE TOOL OF COGNITION. Proceedings of EDULEARN19 Conference 1st-3rd July 2019, Palma, Mallorca, Spain. 10121–10125. Retrieved March 3, 2022, doi: 10.21125/EDULEARN.2019.2529

Klimova, B. (2014). Approaches to the Teaching of Writing Skills. International Conference on Education & Educational Psychology, 112, 147–151.

Kobayashi, H. and Rinnert, C. (2013). L1/L2/L3 writing development: Longitudinal case study of a Japanese multicompetent writer. Journal of Second Language Writing, 22(1), 4–33. Retrieved March 3, 2022, doi: 10.1016/j.jslw.2012.11.001.

Kozbelt, A. (2011). Theories of Creativity. In book: Encyclopedia of Creativity (pp.473-479). Retrieved March 3, 2022, doi: 10.1016/B978-0-12-375038-9.00223-5.

Krasnic, T. (2012). How to Study with Mind Maps: The Concise Learning Method for Students and Lifelong Learners (Expanded Edition). Concise Books, 1-200.

Lamla-Ong, H. (2013). Language Learning Problems and Language Learning Strategies of MFU Students. MFU Connexion: Journal of Humanities and Social Sciences, 2(1), 58-91.

Larios, J. R. D and Coyle, Y. (2013). Exploring the role played by error correction and models on children's reported noticing and output production in a l2 writing task. Studies in Second Language Acquisition, 36(3), 451-485. Retrieved March 3, 2022, doi:10.1017/S0272263113000612.

Lefa, B. (2014). The Piaget Theory of Cognition Development. Educational Psychology, 1(1), 9.

Luangkrajang, M. S. (2022). Use of Mind-Mapping in Language Learning: A Cognitive Approach. Theory and Practice in Language Studies, 12(8), 1616–1621. Retrieved March 3, 2022, https://doi.org/10.17507/tpls.1208.18

Malik, A. and Agarwal, A. (2012). Use of Multimedia as a New Educational Technology Tool–A Study. International Journal of Information and Education Technology. Retrieved March 3, 2022, doi: 10.7763/IJIET.2012.V2.181

Manchón, R. M. (2012). L2 Writing Development: Multiple Perspectives. Retrieved March 3, 2022, Doi:10.1515/9781934078303/html

Mayer, R. E. (2008). Learning and Instruction. New York: Cambridge University Press.

Mayer, R. E. (2009). Multimedia learning (2nd ed.). Cambridge, England: Cambridge University Press.

Mayer, R. E., 2010. Applying the science of learning to medical education. Medical Education, 44, 543–549.

Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 43–71). Cambridge University Press. Retrieved March 3, 2022, doi: 10.1017/CBO9781139547369.005

Mayer, R. E. and Alexander, P. A. (Eds.). (2017). Handbook of research on learning and instruction (2nd ed). New York: Routledge

McLeod, S. A. (2018). Lev Vygotsky. Simply Psychology. Retrieved June 13, 2020 from https://www.simplypsychology.org/vygotsky.html.

Mekala, S. and Geetha, R. (2021). Integrated Practice Of Metacognitive Strategies And Second Language Writing. MIER Journal of Educational Studies Trends & Practices, 11(1), 118–136. Retrieved March 3, 2022, doi: 10.52634/mier/2021/v11/i1/1752

Michalko. M. (2011). Creative Thinkering: Putting Your Imagination to Work Paperback– success book summary. Retrieved July 18, 2020, from https://books.google.co.th.

Mils, K. A. and Unsworth, L. (2018). Multimodal Literacy. In Oxford Research Encyclopaedia of Education. Oxford, UK: Oxford University Press. Retrieved March 3, 2022, doi: 10.1093/acrefore/9780190264093.013.232

Ministry of Education Thailand (2008). The basic education core curriculum. Retrieved April 20, 2021, from http://academic.obec.go.th/images/document/1525235513_d_1.pdf.

Ministry of Education. (2014). Policy of English Language Teaching and Learning Reformation. Retrieved January 16, 2021, from http://english.obec.go.th/index.php/download.

Mislia, T. S., Indartono, S. and Mallisa, V. (2018). Improving Critical Thinking among Junior High School Students through Assessment of Higher–Level Thinking Skills. International Conference on Social Science and Character Educations. Education and Humanities Research, 323. Atlantis Press.

Moqbali, I. S. A., Humaidi, S. A., l Mekhlafi, A. A. and Hilal, M. A. (2020). Metacognitive Writing Strategies Used by Omani Grade Twelve Students. International Journal of Learning, Teaching and Educational Research, 19(8), 214–232. Retrieved March 3, 2022, https://doi.org/10.26803/ijlter.19.8.12

Murray, D. M. (1968). A writer teaches writing: A practical method of teaching composition. Boston, MA: Houghton Mifflin Company.

Nabhan, S. (2016) .The Process Approach to Improve Students' Writing Ability in English Education Department University of PGRI Adi Buana Surabaya. Jurnal Pengajaran Bahasa dan Sastra, 13. Retrieved March 7, 2020, from https://www.researchgate.net/publication/316823668

National Institute of Educational Testing Service (2021). O–NET: Ordinary National Educational Test. Retrieved February 11, 2021, from https://www.niets.or.th/en/catalog/view/2211.

Nawal A. F. (2018) Cognitive load theory in the context of second language academic writing, Higher Education Pedagogies, 3:1, 385–402, Retrieved March 3, 2022, doi: 10.1080/23752696.2018.1513812.

Nhu, P. T. P. and Han, H. V. (2019). Cognitive Factors in Second Language Acquisition: A Study in The English Language Faculty of Ba Ria Vung Tau University, Viet Nam. IOSR Journal of Humanities and Social Science, 24(6), 7. Retrieved May 27, 2021 from www.iosrjournals.org.

Nidayanti. N., Kasim, U. and Heriansyah, H. (2021). An Analysis of Using Mind Mapping Technique to Improve EFL Students' Writing Ability. Research in English and Education (READ), 7(2), 43–52.

Ningrum, A. S. B., Latief, M. A. and Sulistyo, G. H. (2016). The Effect of Mind Mapping on EFL Students' Idea Development in Argumentative Writing across Gender Differences and Learning Styles, 16(1), 149. Retrieved March 3, 2022, doi: 10.21093/di.v16i1.296

Nippold, M. A. (2010). Explaining complex matters: How knowledge of a domain drives language. In M. A. Nippold & C. M. Scott (Eds.), Expository discourse in children, adolescents, and adults: Development and disorders (pp. 41–61). New York, NY: Psychology Press.

Nodoushan, T.J. and Maibodi, A. H. (2017). The Impact of Mind Mapping Strategy on Vocabulary Use in the Writing of Iranian EFL Learners. Retrieved, November 10, 2022, from https://www.researchgate.net/.../318583734_The_Impact_of_Mind_Mapping_Strategy_.

Noom-ura, S. (2013). English-Teaching Problems in Thailand and Thai Teachers' Professional Development Needs. English Language Teaching, 6(11), 139-147.

Nopmanotham, N. (2017). A Study of Writing Strategies Used by Thai EFL High School Students (Master's Thesis). Thammasat University. Retrieved September 19, 2020, from http://ethesisarchive.library.tu.ac.th/thesis/2016/TU_2016_5521032176_6894_4682.pdf.

Nunan, D. (1999). Second Language Teaching and Learning. U.S.: Heinle & Heinle.

Nurlaila, A. P. (2013). The Use of Mind Mapping Technique in Writing Descriptive Text. Journal of English and Education, 1(2), 9-15.

OECD (2019), PISA 2021 Creative Thinking Strategic Advisory Group Report, Organisation for Economic Co-Operation and Development. Retrieved October 2, 2020 from https://one.oecd.org/document/EDU/PISA/GB(2017)19/en/pdf.

Okada, R. (2018). Challenges in Teaching Japanese EFL Students to Express Themselves Logically. Asian Education Studies, 3(1), 73–82. Retrieved March 3, 2022, doi: 10.20849/aes.v3i1.335

Ola W. A. and Walid A. S. (2020). Creative Thinking skills–A Review article (pp.1–21). Retrieved November 11, 2021, from https://www.researchgate.net/publication/349003763.

Oliveira, K.K.S. and Souza, R.A. C. (2022). Digital Transformation towards Education 4.0. Informatics in Education, 21(2), 283–309. Retrieved March 3, 2022, DOI: 10.15388/infedu.2022.13

Onozawa C. (2010). A study of the process writing approach. Research Note, 10, 153–163. Retrieved July 19, 2020 from, https://gair.media.gunmau.ac.jp/dspace/bitstream/10087/7218/1/2010-onozawa2.pdf

Oxford, R. (2011). Strategies for learning a second or foreign language. Language Teaching, 44(2), 167–180. Cambridge University Press. Retrieved November 23, 2020, doi: 10.1017/S0261444810000492

Padang, J. S. M. and Gurning, B. (2014). Improving Students' Achievement in Writing Descriptive Text through Mind Mapping Strategy. Register Journal of English Language Teaching of FBS-Unimed, 3, 1–11.

Palpanadan, S. T., Salam, A. R., and Ismail, F. (2014). Comparative Analysis of Process Versus Product Approach of Teaching Writing in Malaysian Schools: Middle-East Journal of Scientific Research, 22(6), 789–795. Retrieved March 3, 2022, doi: 10.5829/idosi.mejsr.2014.22.06.21943.

Papageorgiou, V. and Lameras, P. (2017). Multimodal Teaching and Learning with the Use of Technology: Meanings, Practices and Discourses. Conference: 14th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2017). Vilamoura, Algarve, Portugal.

Pardede, P. (2020). Integrating the 4Cs into EFL Integrated Skills Learning. Journal of English Teaching, 6(1), 71–85. Retrieved March 3, 2022, DOI: https://doi.org/10.33541/jet.v6i1.190

Piaget, J. (1896–1980). American Psychologist, 36(8), 911–913. Retrieved March 3, 2022, doi: 10.1037/h0078385

Pradasari, N. I. and Pratiwi, I. (2018). Mind Mapping to Enhance Students' Writing Performance. Literature and English Teaching Journal, 8(2), 130–140. Retrieved March 3, 2022, http://jurnal.uin-antasari.ac.id/index.php

Praminatih, G., Kwary, D. A. and Ardaniah, V. (2018). Is EFL students' academic writing becoming more informal?. Airlangga University, Surabaya, Indonesia. Journal of World Languages, 5(2), 101–112. Retrieved March 3, 2022, https://doi.org/10.1080/21698252.2019.1570664.

Pribadi, B. A. and Susilana, R. (2021). The Use of Mind Mapping Approach to Facilitate Students' Distance Learning in Writing Modular Based on Printed Learning Materials. European Journal of Educational Research, 10(2), 907–917.

Puengpipattrakul, W. (2014). A Process Approach to Writing to Develop Thai EFL Students' Socio-Cognitive Skills Walaipun Puengpipattrakul. Electronic Journal of Foreign Language Teaching 2014, 11(2), 270–284.

Purba, R. (2018). Improving the Achievement on Writing Narrative Text through Discussion Starter Story Technique. English Applied Linguistics, State University of Medan, Indonesia. Advances in Language and Literary Studies. Retrieved February 25, 2021, from https//:www.alls.aiac.org.au.

Purnomo, A. (2014). Improving Descriptive Writing Skill through Mind Mapping Technique. REGISTER, 7(2), 245-262.

Rahmawati, I. N., Syafryadin, S. and Widiastuti, R. (2019). Teaching Narrative Writing Using Freaky Fable Game. Jurnal Tadris Bahasa Inggris, 12(2), 147-155.

Raimes, A. (1985). What Unskilled ESL Students Do as They Write: A Classroom Study of Composing. TESOL Quarterly, 19(2), 229-258.

Rajapriya, M. and Kumar, N. (2017). Effectiveness of Mind Mapping in higher Education. International Journal of Civil Engineering and Technology (IJCIET), 8(4), 975-981.

Ratheeswari, K. (2018). Information Communication Technology in Education. Journal of Applied and Advanced Research, 3(1), 45. Retrieved March 3, 2022, doi: 10.21839/jaar.2018.v3iS1.169

Richland, L. E., Frausel, R. and Begolli, K. N. (2016). Cognitive Development. The SAGE Encyclopedia of Theory in Psychology,143–146. Retrieved March 3, 2022, doi: 10.4135/9781483346274.n50

Ruegg, R and Sugiyama, Y. (2010). Do analytic measures of content predict scores assigned for content in timed writing? Melbourne Papers in Language Testing, 15(1), 70–91.

Sabarun, El–Muslimah, A. H. S. and Muhanif, S. (2021). The Effect of Flow Mind Map on Writing Accuracy and Learning Motivation at Islamic Higher Education. Journal of Language and Literature, 16(1), 146–161. Retrieved March 3, 2022, http://journal.unnes.ac.id

Salavati, S. (2016). Use of Digital Technologies in Education. Linnaeus university press. The Complexity of Teachers' Everyday Practice Doctoral dissertation, Department of Informatics, Linnaeus University Press, 317.

Saputra, H. and Marzulina, L. (2016). Teaching Writing By Using Process Genre Approach to The eight Grade Students of SMP NEGERI 22 PALEMBANG. Edukasi: Jurnal Pendidikan Dan Pengajaran, 2(1), 1–12. Retrieved June 7, 2020 from http://jurnal.radenfatah.ac.id/index.php/edukasi/article/view/592.

Sari, S. A. and Sakdiah, H. (2016). The Development of Mind Mapping Media in Flood Material using ADDIE Model. Journal of Education and Learning, 10(1) (53–62). Retrieved March 3, 2022, doi: 10.11591/edulearn.v10i1.3227.

Sasaki, M., Mizumoto, A. and Murakami, A. (2018). Developmental Trajectories in L2 Writing Strategy Use: A Self–Regulation Perspective. The Modern Language Journal. 102(2), 292–309. Retrieved March 3, 2022, https://doi.org/10.1111/modl.12469

Sasongko, F. K. (2017). Improving The 8th Gradetes' Writing Skill Using Mind–Mapping at SMP Negeri 2 Geneng. Proceedings international Seminar on Language, 47–55.

Scott, C. M. (2010). Assessing expository texts produced by school–age children and adolescents. In M. A. Nippold & C. M. Scott (Eds.), Expository discourse in children, adolescents, and adults: Development and disorders (pp. 191–213). New York, NY: Psychology Press.

Şeyihoğlu, A. and Kartal, A. (2010). The Views of the Teachers about the mind mapping technique in the Elementary Life Science and Social Studies lessons Based on the Constructivist Method. Educational Sciences: Theory & Practice, 10(3), 1637–1656.

Sharples, M., Roock, R., Ferguson, R., Gaved, M., Herodotou, C., Koh, E., Kukulska–Hulme, A., Looi, C. K., Mcandrew, P., Rienties, B., Weller, M. and Wong, L. H. (2016). Innovating Pedagogy 2016: Open University Innovation Report 5. Milton Keynes: The Open University.

Seensangworn, P. and Chaya, W. (2017). Writing Problems and Writing Strategies of Enlish Major and Non–English Major Students in a Thai University. Manutsat Paritat: Journal of Humanities, 133–136.

Seyyedrezaei, S. H. and Maftoon, P. (2012). Good Language Learner: A Case Study of Writing Strategies. Theory and Practice in Language Studies, 2(8), 1597–1602. Retrieved March 3, 2022, doi: 10.4304/tpls.2.8.1597–1602.

Silva, R. and Graham, S. (2015). The effects of strategy instruction on writing strategy use for students of different proficiency levels. System, 53, 47–59.

Sinaga, M. (2017). The Effect of Roundtable and Clustering Teaching Techniques and Students' Personal Traits on Students' Achievement in Descriptive Writing. Advances in Language and Literary Studies, 8(6), 69. Retrieved March 3, 2022, doi: 10.7575/aiac.alls.v.8n.6p.69.

Sorden, S. D. (2012). The Cognitive Theory of Multimedia Learning. Mohave Community College/Northern Arizona University. Retrieved January 20, 2021 from https://www.sorden.com/portfolio/sorden_draft_multimedia2012.pdf

Stanković, Z., Maksimović, J. and Osmanović, J. (2018). Cognitive Theories and Paradigmatic Research Posts in the Function of Multimedia Teaching And Learning. International Journal of Cognitive Research in Science, Engineering and Education. 6(2), 107–114.

Steele, V. (2004). Product and process writing. Retrieved December 06, 2021 from http://www.englishonline.org.cn/en/teachers/ workshops/teaching–writing/teaching–tips/product–process.

Sun, L. and Nippold, M. A. (2011). Narrative Writing in Children and Adolescents: Examining the Literate Lexicon. Language Speech and Hearing Services in Schools, 43(1), 2–13. Retrieved March 3, 2022, doi: 10.1044/0161–1461(2011/10–0099)

Suriyanti, S. and Yaacob, A. (2016). Exploring Teacher Strategies in Teaching Descriptive Writing in Indonesia. Malaysian Journal of Learning and Instruction, 13(2), 71–95. Retrieved March 3, 2022, doi: 10.32890/mjli2016.13.2.3.

Suyanto, A. (2010). The Effectiveness of Mind mapping to Teaching Writing Skill View From Their IQ (An Experimental Study in the Seventh Grade Students of SMPN 1 Prambon in the Academic Year 2009/2010). Thesis Examiners of English Education Department of Graduate School of Sebelas Maret University on February 18th, 2020

Talapngoen, S. and Deerajviset, P. (2017). EFL Students' Use of Writing Strategies via Think Aloud Protocol. International Journal of Humanities and Management Sciences (IJHMS), 5(1), 51–54.

Tee, T. K., Azman, M. N. A., Mohamed, S., Muhammad, M., Mohamad, M. M., Md Yunos, J., Yee, M. H. and Othman, W. (2014). Buzan Mind Map: An Efficient Technique for Note–Taking. World Academy of Science. Engineering and Technology International Journal of Psychological and Behavioral Sciences, 8(1), 28–31.

Toba, R., Noor, W. N. and Sanu, L. O. (2019). The Current Issues of Indonesian EFL Students' Writing Skills: Ability, Problem, and Reason in Writing Comparison and Contrast Essay, 19(1), 57–73. Retrieved March 3, 2022, doi: 10.21093/di.v19i1.1506

Truong, M. and Zanzucchi, A. (2012). Going Beyond the Traditional Essay: How New Technologies are Transforming Student Engagement with Writing Outcomes. In book: Increasing Student Engagement and Retention Using Social Technologies (pp.263–288). Retrieved March 3, 2022, doi: 10.1108/S2044–9968(2012)000006B012

Tucker, J. M., Armstrong, G. R. and Massad, V. J. (2010). Profiling a mind map user: a descriptive appraisa. Journal of Instructional Pedagogies, 1–13.

Turkmen, H. and Sertkahya, M. (2015). Creative Thinking Skills Analyzes of Vocational High School Students. Journal of Educational and Instructional Studies in the World, 5 (1), 74–84.

Uccelli, P., Dobbs, C. L. and Scott, J. (2013), Mastering Academic Language, 30(1), 36–62. Retrieved March 3, 2022, doi: 10.1177/0741088312469013.

Vejayan, L. and Yunus, M. M. (2022). Application of Digital Mind Mapping (MINDOMO) in Improving Weak Students' Narrative Writing Performance. Creative Education, 13, 2730–2743. Retrieved March 3, 2022, DOI: 10.4236/ce.2022.138172

Vijayavalsalan, B. (2016). Mind Mapping as a Strategy for Enhancing Essay Writing Skills. The New Educational Review, 137–150. Retrieved March 3, 2022, doi: 10.15804/tner.2016.45.3.11.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Wahyuni, E. (2013). Constructivism Learning Model in Writing Arguments and Description in Indonesian Language of Bogor Agricultural University Student. 2nd International Seminar on Quality and Affordable Education, 100–107. Retrieved April 2, 2021, from https://humanities.utm.my/education/wp-content/uploads/sites/6/2013/11/141.pdf.

Wali, O. and Madani, A. Q. (2020).The Importance of Paragraph Writing: An Introduction. International Journal of Latest Research in Humanities and Social Science, 3(7), 44–50. Retrieved November 20, 2021, from https//www.ijlrhss.com.

Wangmo, K. (2018). The Use of Mind Mapping Technique To Enhance Descriptive Writing Skills Of Grade Four Bhutanese Students. The degree of Master of Education in Curriculum and Instruction. Rangsit University. Retrieved April 10, 2022, from https://rsuirlibrary.rsu.ac.th/bitstream/123456789/780/1/Kinley%20Wangmo.pdf

Wickramasinghe, A., Widanapathirana, N., Liyanage, I. K. and Karunathilake, I. (2011). Effectiveness of mind maps as a learning tool for medical students .South–East Asian Journal of Medical Education, 30–32. Retrieved March 3, 2022, DOI: 10.4038/seajme.v1i1.506

Windura, S. (2013). Shortcut to Genius–1st Mind Map, Jakarta: Elex Media Komputindo.

Yan, G. (2005). A process genre model for teaching writing. English Teaching Forum, 43(3), 18–26.

Yunus, M. M. and Chien, C. H. (2016). The Use of Mind Mapping Strategy in Malaysian University English Test (MUET) Writing. Creative Education, 7, 619–626.

Zhang, Y. (2018) A Contrastive Study on the Application of Mind Maps in Argumentative Writing Instruction for EFL Learners. Canadian Center of Science and Education, 11 (12), 93–100.

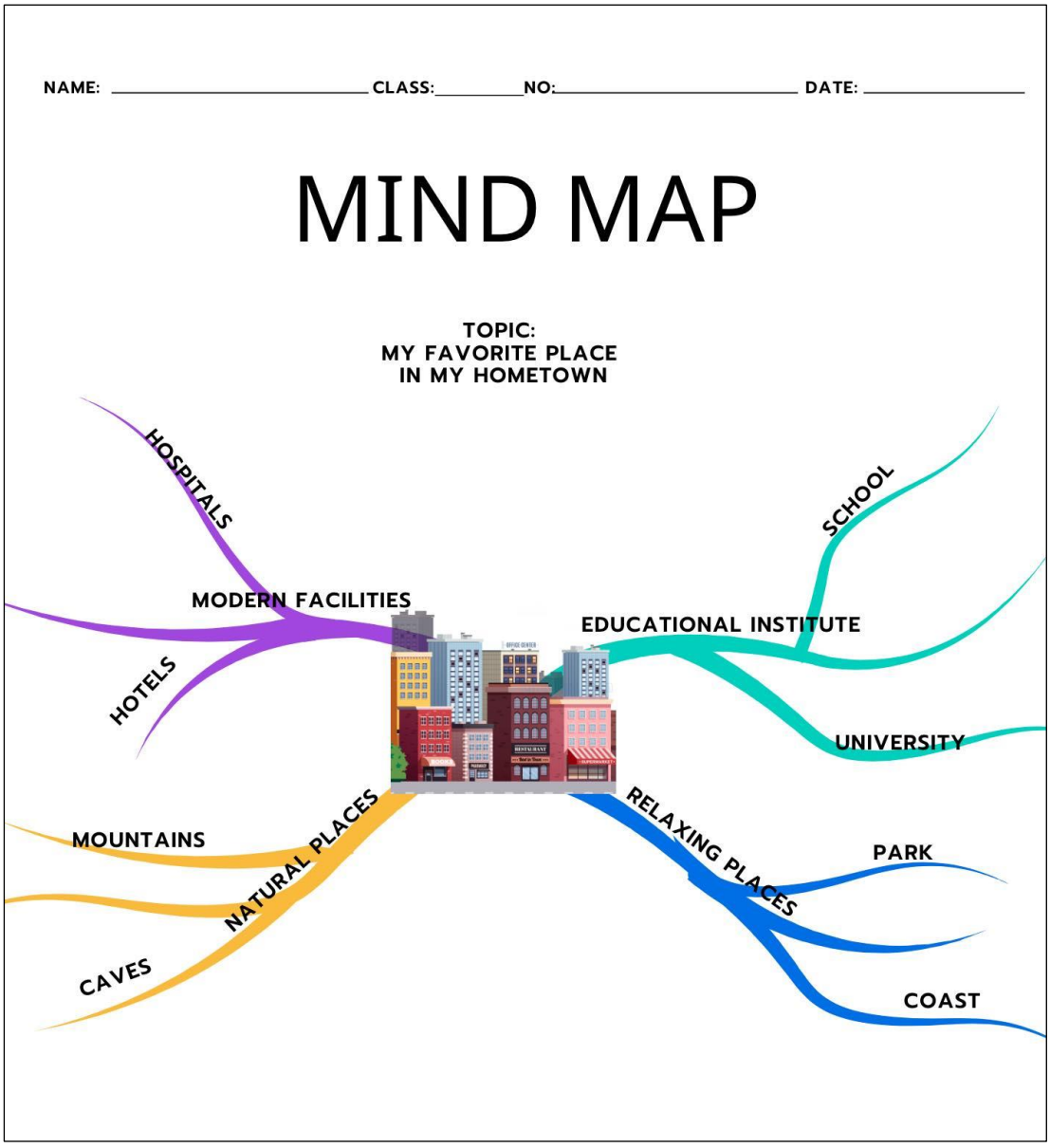
Zhao, Y. (2014). L2 Creative Writers' Identities: Their Cognitive Writing Processes and Sense of Empowerment. International Journal for the Practice and Theory of Creative Writing, 11(3), 452–466. Retrieved March 3, 2022, doi: 10.1080/14790726.2014.956124.

Zhu Z. (2010). Applying Innovative Spirit to Multimedia Foreign Language Teaching. Canadian Center of Science and Education, 3(3).

APPENDIX

APPENDIX A Writing activities through mind maps

Topic 1: My favorite Place in My Hometown

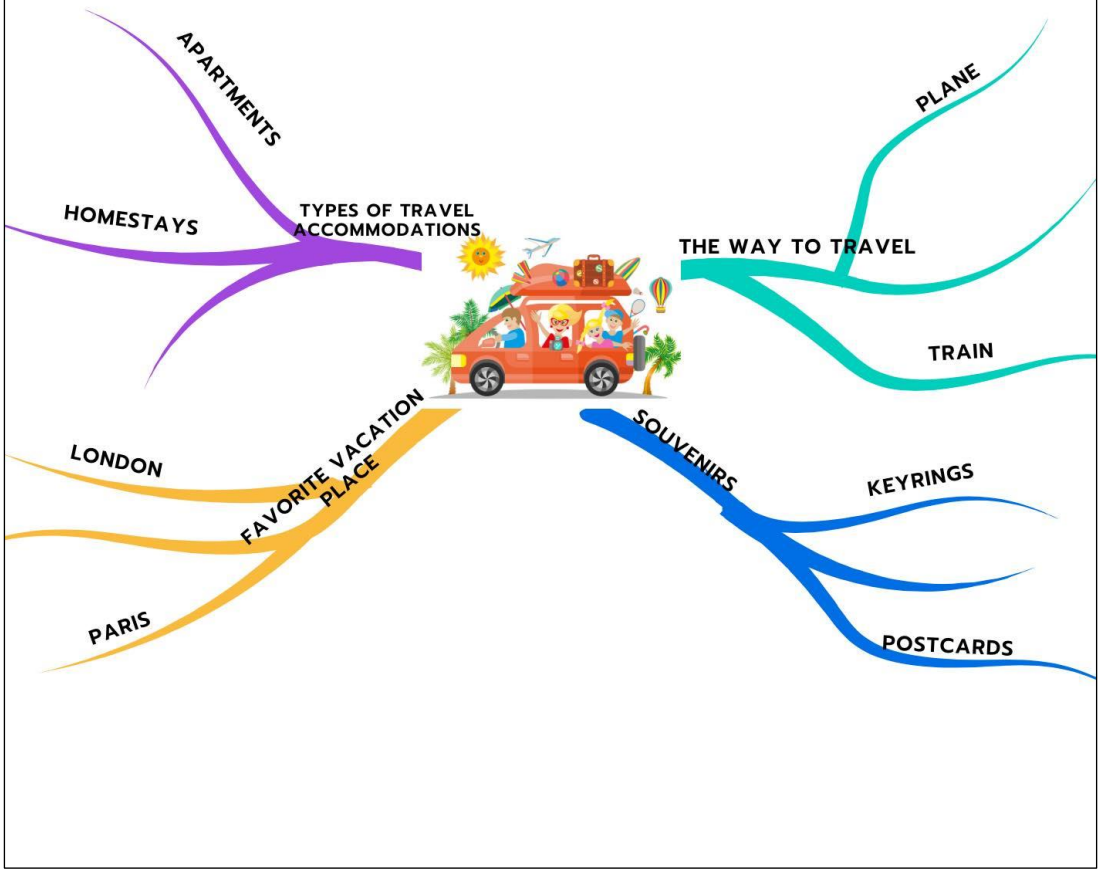


Topic 2: My Perfect Trip

NAME: _____ CLASS:_____NO:_____ DATE: _____

MIND MAP

TOPIC:
MY PERFECT TRIP

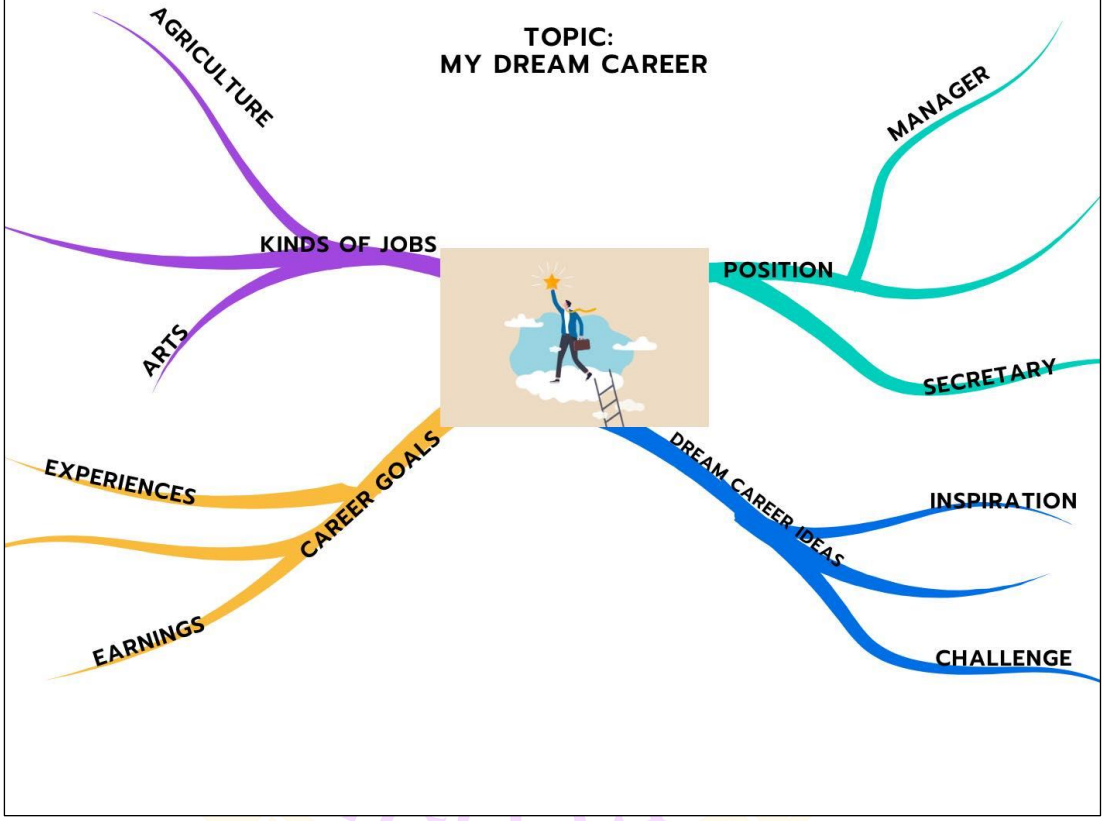


Topic 3: My Dream Career

NAME: _____ CLASS:_____NO:_____ DATE: _____

MIND MAP

TOPIC:
MY DREAM CAREER

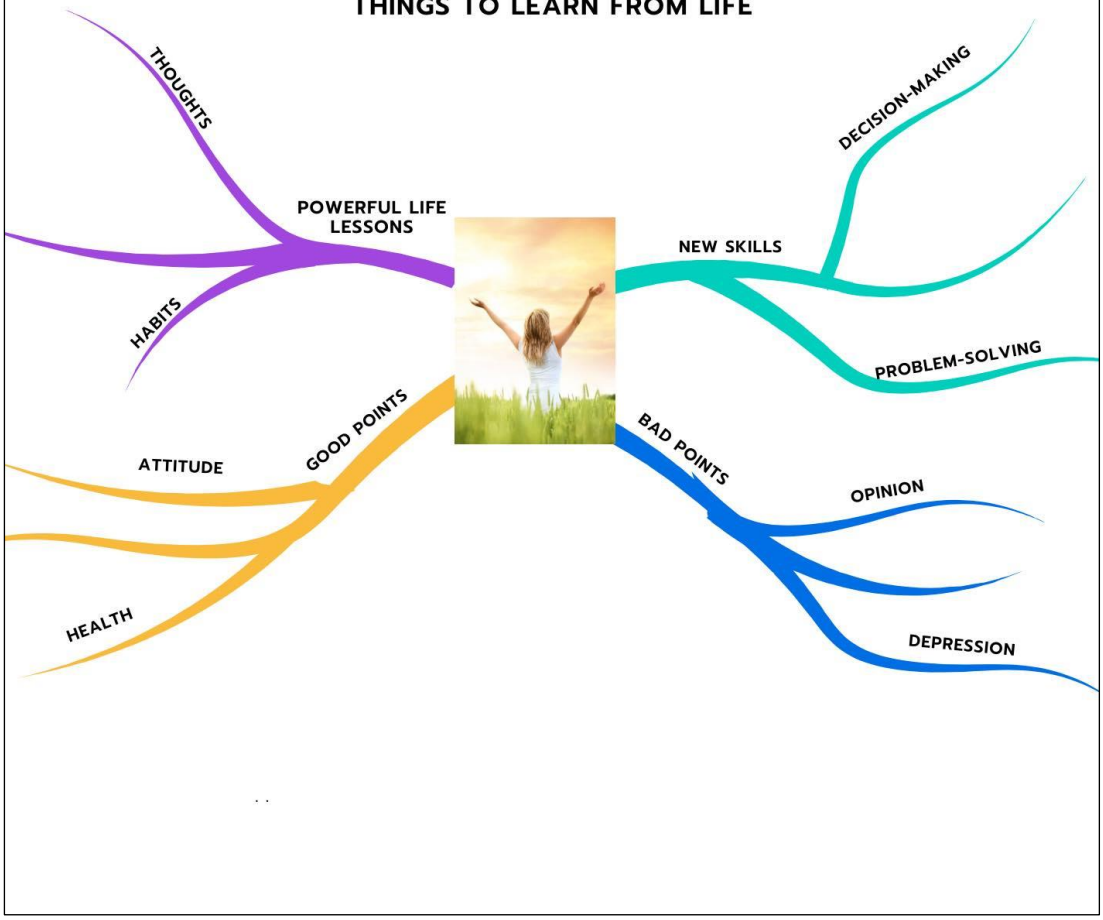


Topic 4: Things to Learn from Life

NAME: _____ CLASS:_____NO:_____ DATE: _____

MIND MAP

TOPIC:
THINGS TO LEARN FROM LIFE

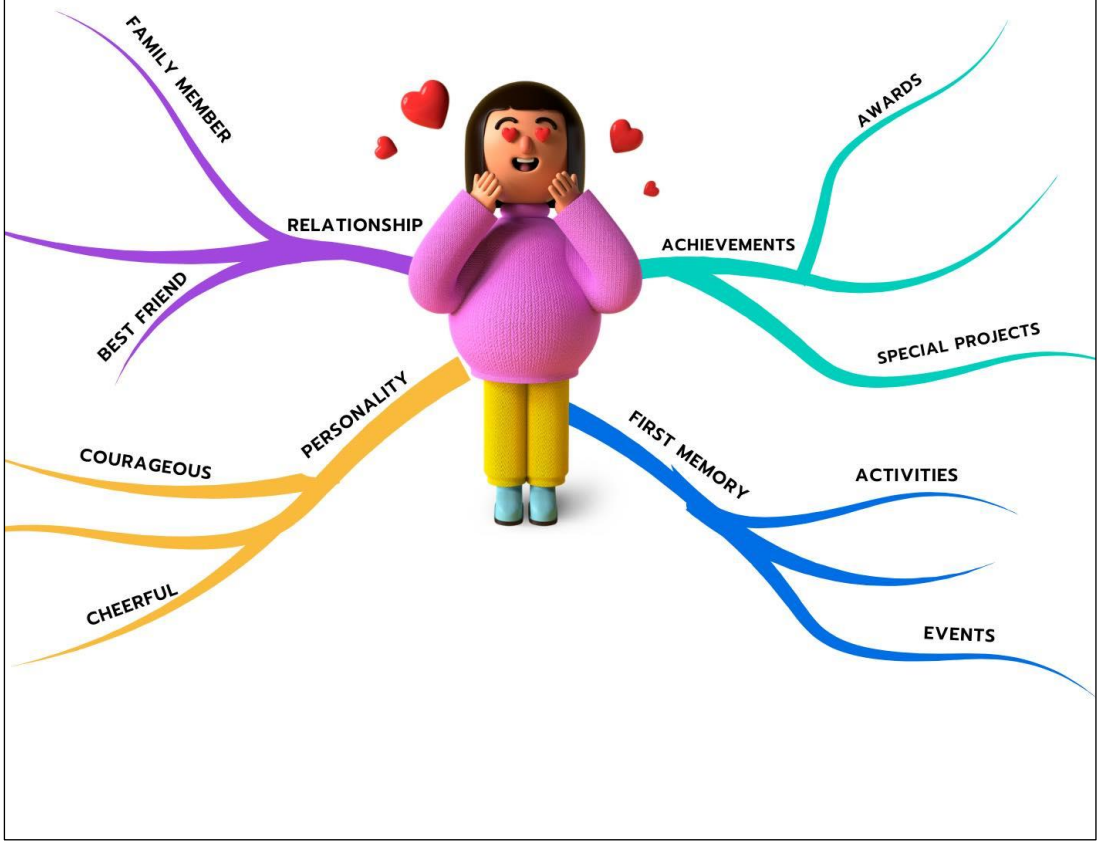


Topic 5: My Favorite Person

NAME: _____ CLASS:_____NO:_____ DATE: _____

MIND MAP

TOPIC:
MY FAVORITE PERSON

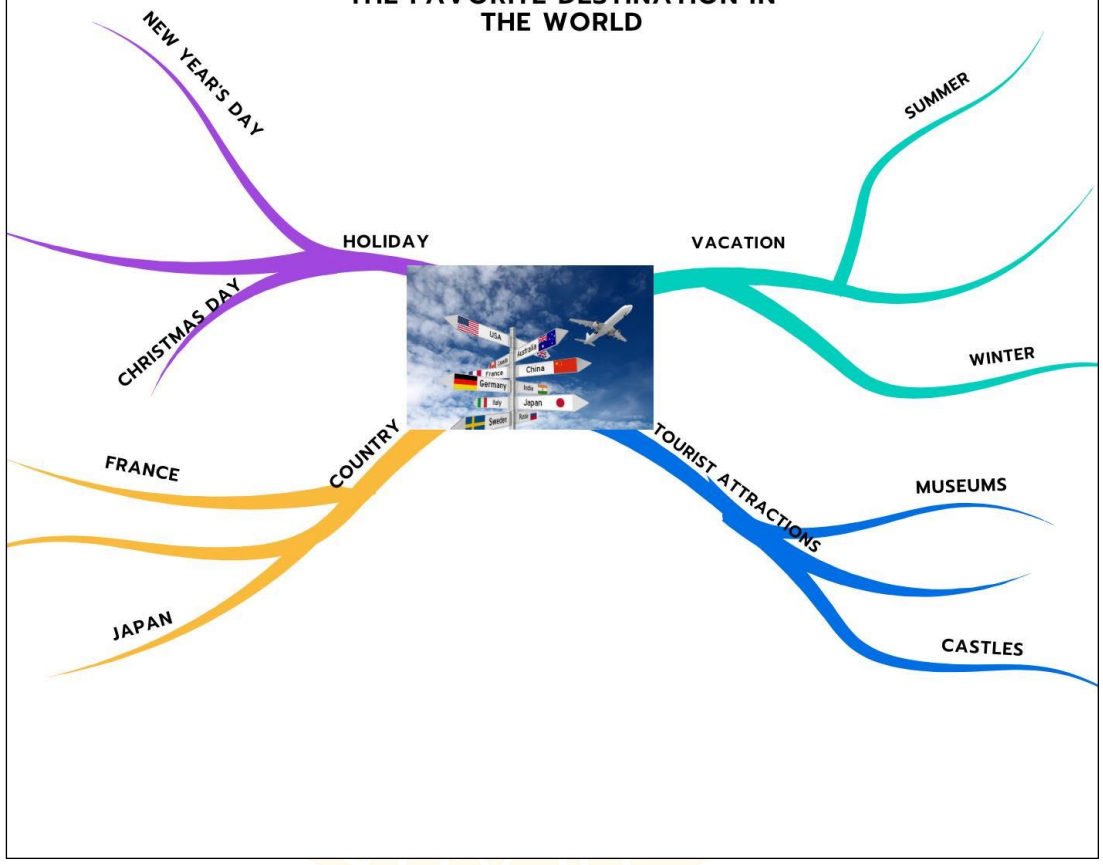


Topic 6: The Favorite Destination in the World

NAME: _____ CLASS:_____NO:_____ DATE: _____

MIND MAP

TOPIC:
THE FAVORITE DESTINATION IN THE WORLD



APPENDIX B The observation checklist

The Observation checklist.

Writing stages	English Proficiency Students	Writing Strategy		
		Learning activities	Evidence	
			Yes	No
1. Pre-writing stage (planning)	S1: High proficiency student	Generating idea		
		Organizing		
		Goal setting		
	S2: High proficiency student	Generating idea		
		Organizing		
		Goal setting		
	S3: Intermediate proficiency student	Generating idea		
		Organizing		
		Goal setting		
	S4: Intermediate proficiency student	Generating idea		
		Organizing		
		Goal setting		
	S5: Low proficiency student	Generating idea		
		Organizing		
		Goal setting		
	S6: Low proficiency student	Generating idea		
		Organizing		
		Goal setting		

Writing stages	English Proficiency Students	Writing Strategy		
		Learning activities	Evidence	
			Yes	No
2. While-writing stage (translating)	S1: High proficiency student	Generating ideas from a mind map		
		Writing paragraph		
	S2: High proficiency student	Generating ideas from a mind map		
		Writing paragraph		
	S3: Intermediate proficiency student	Generating ideas from a mind map		
		Writing paragraph		
	S4: Intermediate proficiency student	Generating ideas from a mind map		
		Writing paragraph		
	S5: Low proficiency student	Generating ideas from a mind map		
		Writing paragraph		
	S6: Low proficiency student	Generating ideas from a mind map		
		Writing paragraph		
3. Post-writing stage (Reviewing)	S1: High proficiency student	Evaluating writing with peer		
		Editing writing individually		
	S2: High proficiency student	Evaluating writing with peer		
		Editing writing individually		
	S3: Intermediate proficiency student	Evaluating writing with peer		
		Editing writing individually		
	S4: Intermediate proficiency student	Evaluating writing with peer		
		Editing writing individually		
	S5: Low proficiency student	Evaluating writing with peer		
		Editing writing individually		
	S6: Low proficiency student	Evaluating writing with peer		
		Editing writing individually		

APPENDIX C Attitude questionnaire

Questionnaire on Students` Attitudes toward using a mind map to enhance L2 writing. Adopted from Kamli (2019)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Enjoyment					
1. I enjoyed constructing a mind map.					
2. I now enjoy solving problems involving circular and rotational motion.					
3. I feel relaxed when I write in English.					
4. I feel excited about writing in English.					
5. I like people to read what I've written in English.					
Ease					
6. It's easy for me to write in English.					
7. t's easy for me to remember information when I am writing in English.					
8. It is easy for me to organize my ideas when I write in English.					
9. It is easy for me to get ideas when I write in English.					
10. It is easy for me to write my ideas in English.					

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Ability/ competence					
11. I understand how to construct a mind map.					
12. I can express my ideas when I write in English.					
13. I think my English papers look good.					
14. I have discussed a mind map with friends.					
15. I get high grades for my English writing.					
Strategy use					
16. Before I write, I outline the ideas I want to write.					
17. Before I write, a mind map helps me to mentally visualize the ideas I want to write.					
18. When I write in English, I think about the topic sentences I want to use.					
19. When I write in English, I think about the paragraphs I want to use.					
20. I connect what I learn to everyday life.					

APPENDIX D Pre–test and post–test written product

Topic: One day in school

Advanced EFL Learner 1 Pretest (A1)
My teenage life was full of obstacles and colors. I have to come to school by my self In the rainy season. it is often a barrier for me to travel to school. I travel by motorbike Some days I go with my friends. When it rains, I have to be late all the time because it's raining. Sometimes it rains so hard that it takes several days until the flood subsides. Personally, I like winter the most. No matter what season it is, you need to adjust to that season. Because I have to meet friends and teachers and buy the most delicious regular food. So no matter what season How many obstacles will there be? I have to fight it and get through it. What about going to my school during high school? it will be the most rewarding and fun life.

Advanced EFL Learner 1 Posttest (A1)
Good morning With the start of the new season at the beginning of my year as soon as the birds chirp wake me up I wake up in the cool, misty, cool breeze, the sunshine, it was the best weather for me. I was so excited to meet up with my friends after a month of not seeing each other. I hurriedly showered, washed my face and brushed my teeth. dress quickly In order to get to school in time, line up, but no, haha. I went to school with a friend. We both went to school very late. Never in time to buy breakfast to eat So have to leave friend to buy every day. When we arrive at school, we line up to do activities in front of the flagpole. When finished, we have lunch and prepare for the first class. And the next period until lunch break, we come to eat with friends. More than noon, we went to buy food in front of the school with friends. We call that market Bua Ban. After finishing, we sit and eat at the cafeteria with friends. In the evening, Bra takes us back tho the dormitory. Then do your homework, shower, eat, iron your clothes and get ready for the next day's school. My life is like this over and over again.

Topic: One day in school

Advanced EFL Student 2 Pretest (A2)

I arrived at school at 7:30 o'clock then I walked to the canteen to wait for my other ~~three~~ friends. When my friend arrived we went into the line in front of the flagpole. After getting in line we go to class usual in the morning At lunchtime my friends and I pack rice and eat together at the canteenia Different people cook delicious food to share. After finishing lunch We go to class as usual when it was time to finish school three of my friends returned to the dormitory I returned to my home

Advanced EFL Student 2 Posttest (A2)

One day in school started off brightly The start of my week is to focus on studying every day of school

I travel from home to school at 7 10 minutes each morning I have to go buy breakfast before heading into the cafeteria with my friends We sit and eat and sit and wait until the time we enter the line After entering the row we go to school as usual We study Science - knit Most of the subjects we studied were math Biology which is somtimes quite boring When it's lunchtime we eat at the noodles very much Most afternoon sessions are with fun teachers After school we parted ways My friends live in the dormitory while I'm at home

One day in my school I met many people including teachers juniors seniors and friends Going to school made us enjoy learning and gained a lot of knowledge.

Topic: One day in school

Intermediate EFL Student 1 Pretest (I1)
I woke up in the morning, I washed my face, brushed my teeth, god dressed until 6:20 and took the van to school. when i go to school After that, I bought some food, got in line, and strated studying math until 10:10 After that I studied English until 11.30 and went to lunch, then continued my Thai language class after the language class. That I am very happy because the next class is chinese language class. After finishing the class, my friends invited me to buy snacks and sit and wait for the van to pick me up together.

Intermediate EFL Student 1 Posttest (I1)
on a bright Wednesday morning, I woke up at 05:30 then I got to take a shower, wash my face and brush my teeth. After that, I come back to change and get dressed. At 06:25, the van came to pick me up. When I arrived at school, I went to buy rice at the school market. to day I bought soi kai to eat. It was very delicious. After that, I went to do activities in front of the flagpole and started my first class which was my favorite subject was math. After that, I went to study English and had lunch with my friends and continued studying in thai and chinese. Then, I and me friends were free to sit and wait for the car together after 16:00 move back.

Topic: One day in school

Intermediate EFL Student 2 Pretest (I2)
_ In the morning when I arrived at school, I went to buy food at Bua Ban and then came to eat at the cafeteria with my friends. Then I went in line to respect the national flag. After finishing the line, I went up to study according to the course At noon, they went to have lunch at the cafeteria and at 12:40 they went up to study according to the course until the end of the class

Intermediate EFL student 2 Posttest (I2)
Yesterday I wofke up at 6 am, Washed my face, brushed my teeth, finished at 7:30 in the morning, my mom cooked me a sandwich. I had breakfast in the van because I got up late. I go to school I go to the cafeteria and read a book. At 7:50 I sing the national anthem, pray, and then go to school. In the morning I study math. I have a lot of fun answering a lot of questions. Next, English and Thai classes. At noon, I ate lunch with a vegetable salad. And in the afternoon I study Computer. I like to study very much because I use Computer. At 4 p.m., I returned home by van. I ate dinner with vegetable salad. I do my homework at 7 p.m. I have a lot of homework. 10 p.m. I take a shower, I brush my teeth and I go to bed.

Topic: One day in school

Beginner EFL Student 1 Pretest (B1)
Today I'm wake up in the morning, I'm brush my tooth and prepare for school, I'm come to school at 7.00 a.m and I meet my friends I and my friends go to the class math, I'm so tried but it's so hard. I'm gonna cry T-T I and my friends eat noodle in canteen it's so yummy I like it, I'm going to the class thai and chinese, I and my friends buy snack and I'm go home.

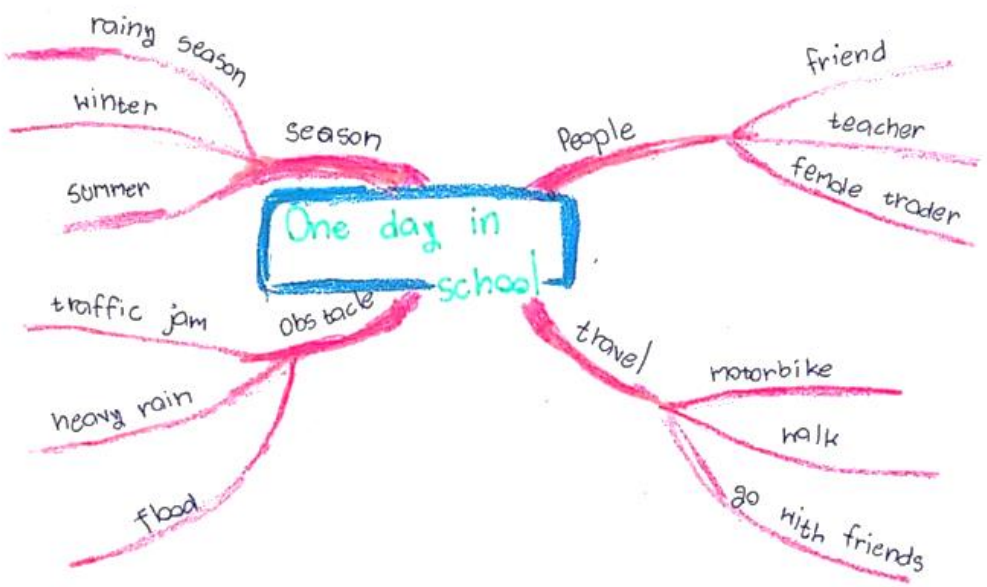
Beginner EFL Student 1 Posttest (B1)
one day in school, the vehicle I go to school with is a van, and the activity I'm participating in is Science Day. My favorite subject is history and my favorite place is the school cafe and computer room.

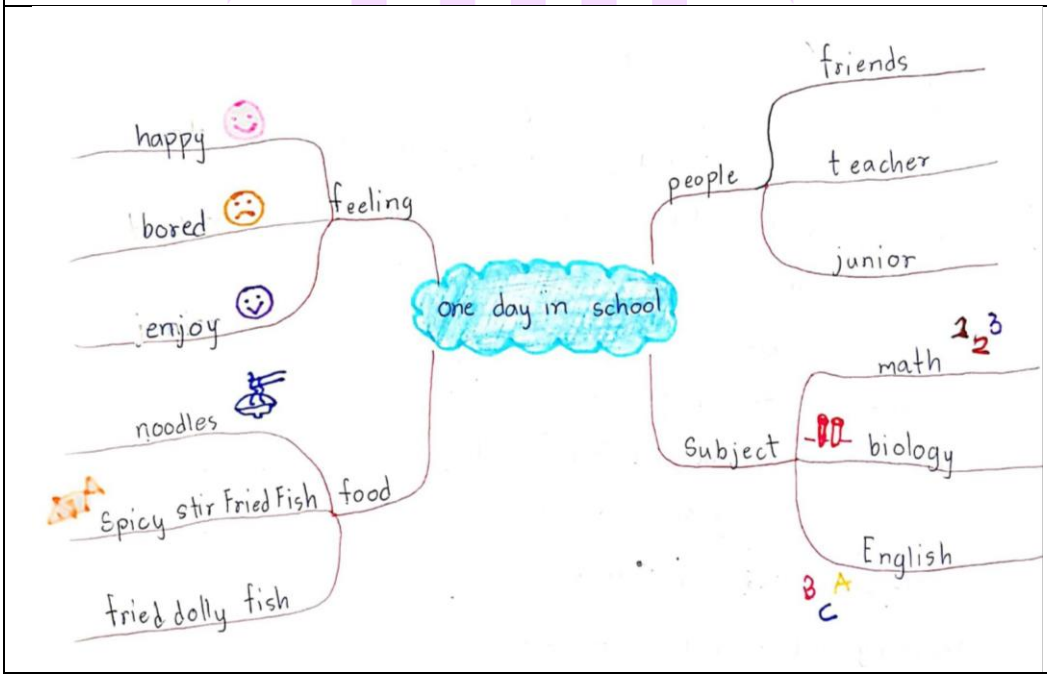
Topic: One day in school

Beginner EFL Student 2 Pretest (B2)
I woke up around 6:30 and came to school by car I went to school and played with my friends To day I have biology class too and I go home ground 4 pm

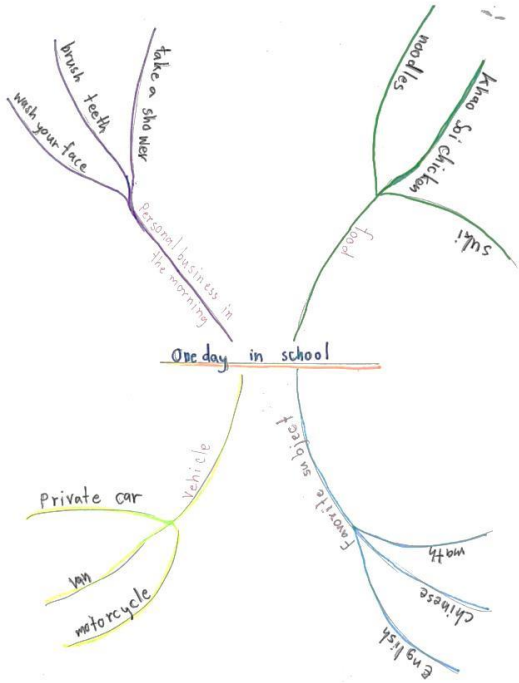
Beginner EFL Student 2 Posttest (B2)
I go to school by 07:00 and the weather is very good I was eating with my friends, start studying class starts at 08:30 11:30 finished school, luch break 12:00 sit down to eat at the cafeteria, sit and talk with friends to discuss the Suffering 13:00 I go to class 15:00 I finish school 16:30 come back to home

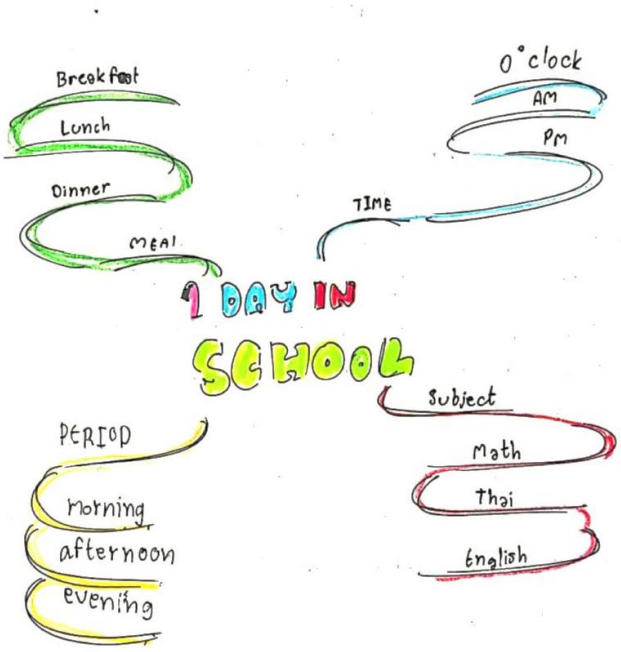
Mind Map

Advanced EFL Student (A1)


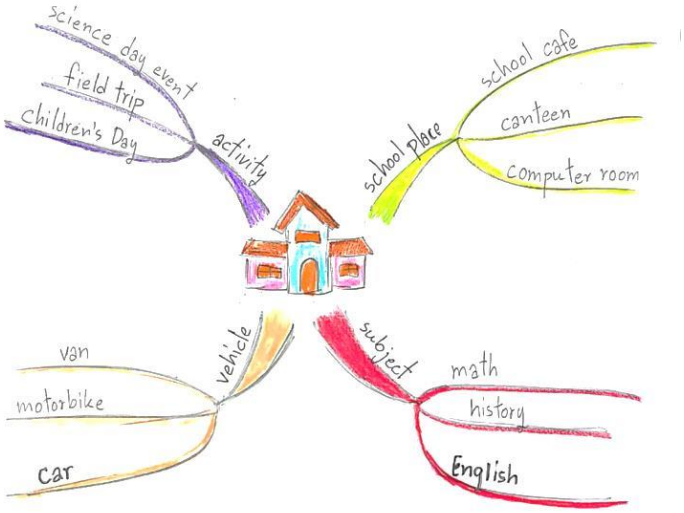
Advanced EFL Student (A2)


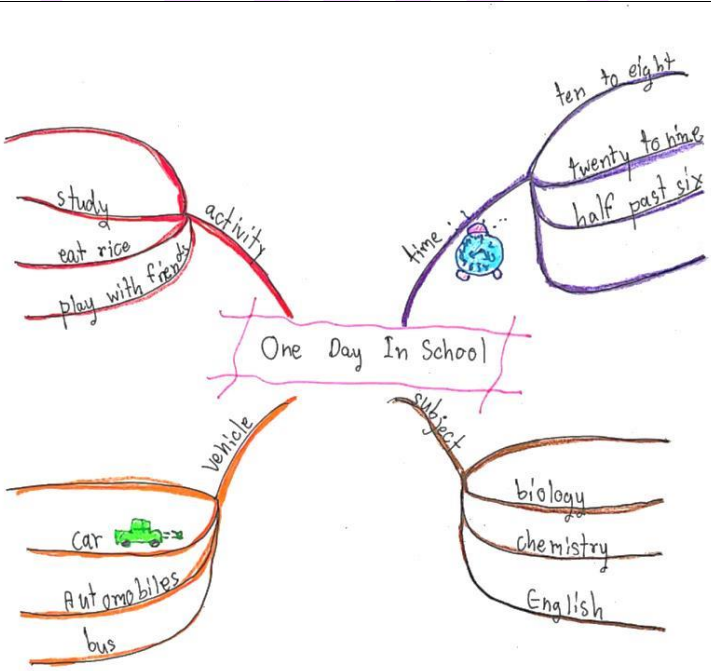
Mind Map

Intermediate EFL Student (I1)


Intermediate EFL Student (I2)


Mind Map

Beginner EFL Student (B1)


Beginner EFL Student (B2)


APPENDIX E Lesson Plan

Lesson Plan 1: My Perfect Place in My Hometown

Lesson Plan 1

Title: My favorite place in my hometown **Length:** 2 hours

Date of teaching:

Objectives:

- Know the mind map
- Know the structure of a paragraph
- Write the descriptive paragraph

No.	Activity/ procedure (Teacher)	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	**Pre-writing stage (planning)** ★ The teacher asks students to sit in groups of six. ★ The teacher gives each group a short paragraph to check their background knowledge about the structure of the paragraph. ★ The students analyze the paragraph. ★ The teacher shows the structure of the paragraph (hamburger paragraph writing)	<u>Group writing activities (6 students)</u> 1. Planning their descriptive paragraph writing in small group activities by 1.1 generating ideas 1.2 organizing ideas 1.3 goal setting. **2. Creating mind maps as a model of writing** 2.1 using keywords 2.2 organizing mind maps according to keywords	▪ Sample paragraph ▪ Paragraph organization (Hamburger writing chart) ▪ Model of mind map ▪ Students' mind map ▪ <u>Group writing checklist</u>	30 mins

No.	Activity/ procedure (Teacher)	Activity/ procedure (Students) Sample	Research Instruments	Time
	★ on the PPT and check the answer from the students. ★ The teacher asks the students to plan their descriptive paragraph writing in small group activities by generating ideas, organizing ideas, and goal setting. ★ The teacher uses a mind map as a good model of writing. Then, he/she asks the students to create a mind map as an organization of descriptive paragraph writing on the given topic (My favorite place in my hometown)			
2.	**While-writing stage (translating)** ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the	▪ <u>Pair activities (Peer writing/ peer review)</u> 3. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ <u>Peer review checklist</u> (e.g. vocabulary, paragraph organization, grammar)	50 mins

No.	Activity/ procedure (Teacher)	Activity/ procedure (Students) Sample	Research Instruments	Time
	ideas and composing the ideas that they have done in the pre-writing stage.			
3.	**Post-writing stage (reviewing)** ■ The teacher asks the students to review and evaluate their writing with their peers. ■ The teacher asks the individual students to revise their paragraph writing by themselves.	■ <u>Individual writing (writing by the self)</u> **4. <u>Reviewing own writing</u>** 4.1 Reviewing paragraph writing according to the mind map 4.2 Evaluating the paragraph writing by using self-checklist	– Self-checklist of paragraph writing – Final product of paragraph writing	40 mins

Lesson Plan 2

Title: My perfect trip **Length:** 2 hours

Date of teaching:

Objectives:

- Know the writing process
- Identify the topic sentence, the supporting details, and the concluding sentence of a paragraph
- Write the descriptive paragraph

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	**Pre-writing stage (planning)** ▪ The teacher introduces the writing process to the students using PPT. ▪ The teacher gives each group a paragraph. ▪ Each group identifies the topic sentence, the supporting details, and the concluding sentence. ▪ The teacher uses different	<u>Group writing activities (6 students)</u> 1. Identifying the topic sentence, the supporting details, and the concluding sentence 2. Brainstorming ideas for the given topic, by designing a mind map.	▪ Sample paragraph ▪ Students' mind map ▪ <u>Group writing checklist</u>	30 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ highlighting colors to show students the topic sentence, the supporting details, and the concluding sentence. ▪ The teacher gives each group a topic (My perfect trip). ▪ The students are asked to brainstorm ideas for the given topic, by designing a mind map.			
2.	**While-writing stage (translating)** ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the ideas and composing the ideas that they have done in the pre-writing stage.	▪ <u>Pair activities (Peer writing/ peer review)</u> 3. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ Descriptive paragraph writing model. ▪ <u>Peer review checklist</u> (e.g. vocabulary, paragraph organization, grammar)	50 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
3.	**Post-writing stage (reviewing)** ▪ The teacher asks the students to review and evaluate their writing with their peers. ▪ The teacher asks the individual students to revise their paragraph writing by themselves.	▪ <u>Individual writing (writing by the self)</u> <u>4. Reviewing own writing</u> 4.1 Reviewing paragraph writing according to the mind map 4.2 Evaluating the paragraph writing by using self-checklist	– Self-checklist of paragraph writing – Final product of paragraph writing	40 mins

Lesson Plan 3

Title: My dream career **Length:** 2 hours

Date of teaching:

Objectives:

- Know coherence and cohesion in writing
- Write the descriptive paragraph

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	**Pre-writing stage (planning)** ▪ The teacher introduces the coherence and cohesion in writing to the students using PPT. ▪ The teacher gives each group a paragraph. ▪ Each group highlights coherence and cohesion in the given paragraph. ▪ The teacher shows students how to use coherence and cohesion in writing.	<u>Group writing activities (6 students)</u> 1. highlighting coherence and cohesion in the given paragraph. 2. Brainstorming ideas for the given topic, by designing a mind map.	▪ Sample paragraph ▪ Students' mind map ▪ <u>Group writing checklist</u>	30 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ The teacher gives each group a topic **(My dream career)**. ▪ The students are asked to brainstorm ideas for the given topic, by designing a mind map.			
2.	**While-writing stage (translating)** ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the ideas and composing the ideas that they have done in the pre-writing stage.	▪ <u>Pair activities (Peer writing/ peer review)</u> 3. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ Descriptive paragraph writing model. ▪ <u>Peer review checklist</u> (e.g. vocabulary, paragraph organization, grammar)	50 mins
3.	**Post-writing stage (reviewing)** ▪ The teacher asks the students to review and evaluate their writing with their peers.	▪ <u>Individual writing (writing by the self)</u> **4. <u>Reviewing own writing</u>** 4.1 Reviewing paragraph writing	- Self-checklist of paragraph writing - Final product of paragraph writing	40 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ The teacher asks the individual students to revise their paragraph writing by themselves.	according to the mind map 4.2 Evaluating the paragraph writing by using self-checklist		

Lesson Plan 4

Title: Things to learn from life **Length:** 2 hours

Date of teaching:

Objectives:

- Identify the different types of descriptive paragraphs: person, place, object, and event.
- Write the descriptive paragraph

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	Pre-writing stage (planning) ▪ The teacher introduces the types of descriptive paragraphs to the students using PPT. ▪ The teacher gives each group a paragraph. ▪ Each group identifies the types of given descriptive paragraphs. ▪ The teacher gives each group a topic (Things to learn from life).	Group writing activities (6 students) 1. Identifying the types of given descriptive paragraphs 2. Brainstorming ideas for the given topic, by designing a mind map.	▪ Sample paragraph ▪ Students' mind map ▪ Group writing checklist	30 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ The students are asked to brainstorm ideas for the given topic, by designing a mind map.			
2.	While-writing stage (translating) ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the ideas and composing the ideas that they have done in the pre-writing stage.	▪ Pair activities (Peer writing/ peer review) 3. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ Descriptive paragraph writing model. ▪ Peer review checklist (e.g. vocabulary, paragraph organization, grammar)	50 mins
3.	Post-writing stage (reviewing) ▪ The teacher asks the students to review and evaluate their writing with their peers. ▪ The teacher asks the individual students to revise their paragraph	▪ Individual writing (writing by the self) 4. Reviewing own writing 4.1 Reviewing paragraph writing according to the mind map	- Self-checklist of paragraph writing - Final product of paragraph writing	40 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	writing by themselves.	4.2 Evaluating the paragraph writing by using self-checklist		

Lesson Plan 5

Title: My favorite person **Length:** 2 hours

Date of teaching:

Objectives:

- Select the best topic sentence for each paragraph
- Write the descriptive paragraph

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	**Pre-writing stage (planning)** ▪ The teacher gives students a worksheet containing five paragraphs and a selection of five topic sentences for each one. ▪ The students work in their groups to select the best topic sentence for each paragraph. ▪ The teacher shows the paragraphs on the PPT and elicits answers from students.	Group writing activities (6 students) 1. Selecting the best topic sentence for each paragraph. 2. Brainstorming ideas for the given topic, by designing a mind map.	▪ Sample paragraph ▪ Students' mind map ▪ Group writing checklist	30 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ The teacher gives each group a topic (My favorite person). ▪ The students are asked to brainstorm ideas for the given topic, by designing a mind map.			
2.	**While-writing stage (translating)** ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the ideas and composing the ideas that they have done in the pre-writing stage.	▪ <u>Pair activities (Peer writing/ peer review)</u> 3. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ Descriptive paragraph writing model. ▪ <u>Peer review checklist</u> (e.g. vocabulary, paragraph organization, grammar)	50 mins
3.	**Post-writing stage (reviewing)** ▪ The teacher asks the students to review and evaluate their writing with their peers.	▪ <u>Individual writing (writing by the self)</u> **4. <u>Reviewing own writing</u>** 4.1 Reviewing paragraph	- Self- checklist of paragraph writing - Final product of paragraph writing	40 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	▪ The teacher asks the individual students to revise their paragraph writing by themselves.	writing according to the mind map 4.2 Evaluating the paragraph writing by using self-checklist		

Lesson Plan 6

Title: The favorite destination in the world **Length:** 2 hours

Date of teaching:

Objectives:

- Edit a written paragraph
- Write the descriptive paragraph

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
1.	**Pre-writing stage (planning)** ▪ The teacher distributes paragraphs to each group. ▪ The students are asked to read the paragraph in their groups and find the mistakes. ▪ The students have to categorize the mistakes as follows: grammar, spelling, punctuation, and organization. ▪ The teacher shows the marks of	<u>Group writing activities (6 students)</u> 1. Reading the paragraph in their groups and find the mistakes. 2. Categorizing the mistakes as follows: grammar, spelling, punctuation, and organization. 3. Brainstorming ideas for the given topic, by designing a mind map.	▪ Sample paragraph ▪ Students' mind map ▪ <u>Group writing checklist</u>	30 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
	mistakes on the paragraph using PPT. ▪ The teacher gives each group a topic (The favorite destination in the world). ▪ The students are asked to brainstorm ideas for the given topic, by designing a mind map.			
2.	**While-writing stage (translating)** ▪ The teacher provides B1 vocabulary lists and the descriptive paragraph writing model. ▪ The students and their peers write a descriptive paragraph by translating the ideas and composing the ideas that they have done in the pre-writing stage.	▪ <u>Pair activities (Peer writing/ peer review)</u> 4. Translating ideas into a paragraph	▪ B1 vocabulary lists ▪ Descriptive paragraph writing model. ▪ <u>Peer review checklist</u> (e.g. vocabulary, paragraph organization, grammar)	50 mins

No.	Activity/ procedure	Activity/ procedure (Students) Sample	Research Instruments	Time
3.	**Post-writing stage (reviewing)** ▪ The teacher asks the students to review and evaluate their writing with their peers. The teacher asks the individual students to revise their paragraph writing by themselves.	▪ <u>Individual writing (writing by the self)</u> 5. <u>Reviewing own writing</u> 5.1 Reviewing paragraph writing according to the mind map 5.2 Evaluating the paragraph writing by using self-checklist	– Self-checklist of paragraph writing – Final product of paragraph writing	40 mins

BIOGRAPHY

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