CONCEPT MAPPING FOR ENHANCED CRITICAL THINKING IN ARGUMENTATIVE WRITING AMONG ESL LEARNERS

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Abstract

Critical Thinking (CT) skills are indispensable in the 21st century. Writing, as one of the most difficult skills to master, becomes even more challenging when CT skills are demanded. Despite the encouragement of Higher Order Thinking Skills (HOTS) in the Malaysian English writing curriculum, writing skills among students are still below satisfactory levels as seen in Malaysian University English Test (MUET) reports. As Concept Maps (CM) are versatile and dynamic tools with a theoretical foundation in CT and Ausubel's meaningful learning, the current study aims to investigate whether the incorporation of CM enhances CT in argumentative writing and determine the levels of CT in ESL learners' argumentative writing. The study employed quantitative methods with an experimental design. 40 students from a secondary school in Perak, Malaysia were selected via purposive sampling. The Experimental Group (EG) underwent CM method in teaching argumentative writing whereas the Control Group (CG) underwent traditional methods to do so. Participants were administered essays for the pre- and post-tests which were then graded using the Illinois Critical Thinking Essay Rubric. The researcher employed Statistical Package for the Social Sciences (SPSS) and paired samples t-tests to analyse the pre-test and post-test scores of the different groups and the individual scores of the CT features in the rubric. It was found that the use of CM significantly contributed to enhancing the CT skills of the students in their argumentative writing, with the EG achieving a mean difference of 3.15 in their pre- and post-test scores, compared to the CG that achieved a mean difference of only 1.70. However, the participants CT levels were found to be far from 'well-developed' with an average score of only 3.9 out of 6 points, depicting the CT climate in Malaysian classrooms. This study holds implications as it highlights the importance of the integration of CM into ESL writing practices, the need for further CT instruction and the additional strategies that are needed for the CM approach to teach CT in Malaysian ESL classrooms.

Keywords: concept mapping, critical thinking, ESL, argumentation, writing

Subject area: LB5-3640 Theory and practice of education

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Abbreviation	Definition
CT	Critical Thinking
CM	Concept Mapping
SPSS	Statistical Package for the Social Sciences
EG	Experimental Group
CG	Control Group

CHAPTER 1: INTRODUCTION

This chapter serves as an introductory section to the study and provides an overview of the research topic, its significance, the research objectives, and the structure of the thesis.

1.0 Background of the study

This section covers the background of the research, covering aspects such as the relevance of Critical Thinking in the modern day, the importance of writing and the Critical Thinking and Writing in the Malaysian context.

Undisputedly, Critical Thinking (CT) stands as an indispensable skill in the 21st century. According to the Partnership for 21st Century skills (P21) by Trilling & Fadel (2012), CT is listed among the 7C skills (Critical Thinking, Creativity, Collaboration, Career and learning self-reliance, Cross-cultural understanding, Communication, information and media literacy, Computing and ICT literacy) that are vital for students' 21st century readiness. CT is also important in producing individuals who are skilled and competent in the workplace of a fast-moving, global arena. More recently, in response to the demands of Industry 4.0, Education 4.0 emerged in order to facilitate students to become valuable employees in a technological environment. Again, CT stands among the transversal competencies (Critical Thinking, Cooperation, Collaboration, Communication, Creativity) listed in the core components (González-Pérez & Ramírez-Montoya, 2022). This shows the importance of CT skills even with the digital transformation in the education field and shows how important CT skills are in the Industry 4.0 workforce.

The Malaysian education system has taken various initiatives to promote critical thinking in which Higher Order Thinking Skills (HOTS) was introduced in 2013 as a component of the Malaysia Education Blueprint (MEB) (Ministry of Education Malaysia, 2012). It has been said that historically, the Malaysian education system has fallen behind in this aspect, as students often struggle to apply knowledge and think critically beyond

conventional academic settings (Ministry of Education Malaysia, 2012). In the MEB for Higher Education 2015-2025, employers express that graduates lack crucial skills like critical thinking and proficiency in English, which are vital for success in the 21st century (Ministry of Education Malaysia, 2015). Overall, while the Malaysian education system has made efforts to promote critical thinking through different initiatives, there remains a gap in equipping students with such skills for success in the modern era.

Critical thinking competence is vital to write effectively as students need to be able to formulate opinions and arguments through strong reasoning to support their viewpoints (Suhartoyo, 2017). However, learners in Malaysia are not active in applying CT skills in which this shortcoming is particularly evident in written works. Although CT is embedded in the syllabus through initiatives like HOTS, it is seldom practiced in classrooms due to factors such as teacher reluctance to implement CT skills (Yunusa et al., 2019) and teachers' under preparedness to infuse CT into classroom activities (Singh et al., 2018). Nevertheless, it is imperative that students should possess critical thinking skills in order to write in an effective and productive manner (Suhartoyo, 2017).

Among the four skills in English, writing is one of the methods to assess students' English proficiency in Malaysia besides speaking, reading and listening. With the nature of the Malaysian education system being highly exam-oriented (Zulkurnain et al., 2019), proficiency in writing is positioned as one of the emphasized, core skills to pass. This can be seen through the higher allocation of marks for writing (60 marks) in the national secondary school test, Sijil Peperiksaan Malaysia (SPM), as compared to reading (40 marks), speaking (20 marks) and listening (30 marks) prior to 2021 (Lembaga Peperiksaan Malaysia, 2020). According to Yunus, Zakaria & Suliman (2019), it is necessary for students to master English - especially writing - for a multitude of reasons like communication purposes, job requirements and for science and technological advancements. This is supported by Awang et

al., (2021) who highlighted that in the 21st century, proficient English writing stands out as a crucial skill for global communication as it enables students to express themselves, develop cognitive skills, engage in feedback exchanges and present logical arguments effectively. These skills are particularly valuable in the workplace where employees are required to write from simple documents such as meeting agendas to difficult documents like project proposals. Furthermore, writing is one of the most difficult components to master compared to the other skills due to the many knowledge requirements needed such as grammar, spelling and vocabulary (Yunus, Zakaria & Suliman, 2019). Thus, preparing students to write effectively should be one of the goals for a language teacher.

In writing, concept maps have been adopted in many ESL classes particularly in the teaching of writing where teachers use mind maps for activities such as brainstorming and pre-writing. There has been a growing body of research regarding the use of concept maps in writing as it promotes critical thinking implicitly (Harris & Zha, 2013). Given the growing interest in this area, the present study aims to investigate the potential benefits of incorporating concept maps into writing instruction, specifically focusing on argumentative writing. Argumentative writing demands a high level of critical thinking as it requires students to analyze complex information, evaluate evidence, and construct persuasive arguments. In addition, the composing of argumentative essays requires thoroughly planned teaching and learning strategies (Maekong, 2015). By integrating concept maps into the writing process, the study seeks to explore whether this instructional approach can effectively enhance students' CT skills within the context of argumentative writing tasks. Hence, the present study seeks to explore whether the incorporation of Concept maps in writing instruction enhances CT in Argumentative writing.

1.1 Statement of Problem

This section outlines the problem of the study particularly surrounding issues about Critical Thinking and Writing in the context of the Malaysian English classroom. It also highlights the gap to be addressed.

Despite the encouragement of Higher Order Thinking Skills (HOTS) in the Malaysian English writing curriculum, writing skills among students are still below satisfactory levels. According to the 2022 MUET Performance report, under argumentative essay writing, candidates were said to respond insufficiently due to the lack of subject-matter knowledge and weak language proficiency (‘MUET 2022 Exam Report’, 2023). Furthermore, it was highlighted that arguments posed lacked proper organisation and coherence, were ‘shallow and unconvincing’, ‘superficial’, ‘vague’ and ‘lacked depth and maturity’. Limited knowledge on current issues and content knowledge were also emphasised among the weaknesses coupled with the failure to elaborate and substantiate ideas. These alarming comments in the report reflect the current state of writing among Malaysian students in which students fail to incorporate Critical Thinking skills into their writing.

Additionally, considering the context of the L2 learning culture in the Malaysian ESL classroom, students tend to focus on acquiescence over questioning (McKinley, 2013). Writing is executed through the rote-memorisation and the regurgitation of ideas to pass exams (Joharry, 2016). Therefore, this study seeks to investigate whether the incorporation of Concept maps would aid in scaffolding and refining CT skills in argumentative writing among Malaysian ESL students so that students can write more effectively. This study also intends to address and identify areas that can be improved in teaching argumentative writing in ESL classrooms.

1.3 Research Questions

RQ1 Does the use of Concept Mapping contribute to the enhancement of CT skills in argumentative writing among Malaysian ESL students?

RQ2 What are the levels of CT skills in students' argumentative essays after CM was introduced?

1.4 Research Objectives

RO1 To determine whether the use of concept mapping contributes to the enhancement of CT in argumentative writing among Malaysian ESL students.

RO2 To examine the levels of CT skills in students' argumentative essays after CM was introduced.

1.5 Significance of the study

This section highlights the significance of the study in the broader context and to different stakeholders such as educational institutions, teachers and students.

This study's findings will reveal how concept maps play a role in inculcating CT skills among students in the argumentative writing field. As concept maps are simple to apply in writing classes, this study would strengthen existing findings on the benefits of including concept maps as a pre-writing strategy among ESL students.

For the education system and schools in Malaysia, the study offers insights into the utilization of concept maps as an effective and feasible instructional strategy for enhancing critical thinking skills in argumentative writing. It provides evidence-based approaches that can be integrated into curriculum design and teaching practices to better prepare students for academic and real-world writing tasks. As it is simple to use, the concept mapping method can be integrated into the Malaysian ESL syllabus in aiding student's critical thinking abilities in writing.

This study will also be significant for educators and teachers, especially in the field of writing. The findings of this study will reveal the significance of concept mapping as an instructional strategy in which the method may be incorporated more frequently into writing classes to encourage CT among students. Educators may also enhance and refine their strategies in teaching writing in order to create engaging and effective learning experiences that support the development of cognitive skills in writing. The study may also be significant in informing teachers of the importance of emphasizing CT in daily activities or assessments. Through the honing of CT skills in writing, teachers can better equip students to meet the demands of the workforce in the 21st century.

Students may also benefit from this study as they will be able to enhance their ability to analyze complex issues, evaluate evidence, and construct persuasive arguments in writing, which are essential skills for academic success and future career opportunities. With the enhancement of their CT skills through concept mapping, students are able to emerge in the workforce as critical thinkers of the 21st century. Students will also be able to write more effectively and be more aware of CT skills in their writing activities through the strategy of concept mapping. They will also be able to better link ideas as see relations between them.

In ESL education, the development of CT skills is vital in achieving academic success and eventually, effective communication in the workplace. These CT skills can be seen at work particularly in Argumentative writing where CT is needed for students to articulate and defend certain viewpoints coherently. However, this becomes a struggle for learners as they lack the CT skills to write effectively in Argumentative essays. Many ESL learners struggle to develop CT skills in writing, resulting in poor academic results and poor communication skills in the workplace particularly in writing. The current research aims to address this issue by investigating the effectiveness of Concept Maps as tools to enhance CT in Argumentative Writing. Cottenie & Staempfli's study (2016) revealed a significant improvement in CT

scores after the implementation of Concept mapping exercises. The study found that students were able to open up to new ideas, actively analyse written or spoken discourse to certain degrees and challenge self-beliefs.

Thus, enhancing CT skills through Concept mapping not only benefits the ESL learners academically, but also equips the students with essential skills that are needed in professional contexts where effective argumentation is crucial. The enhancement of CT skills also has the potential to improve overall learning outcomes and to promote lifelong learning habits to think critically among ESL students. Ultimately, this study contributes to the broader goal of empowering ESL learners to communicate confidently and competently in English particularly in academic and professional contexts.

1.6 Limitations and Scope of the study

There are a few limitations that the researcher is able to identify from this study. Firstly, as the study will involve only two selected classrooms of ESL learners from a specific educational institution or setting in Perak, Malaysia, findings may only be applicable to the specific group of ESL learners and cannot be generalized to the bigger population of ESL learners. Next, Learners' writing proficiency, prior knowledge differences, individual learning preferences, individual differences, including language backgrounds and language abilities are not taken into account, thus might affect students' writing abilities and CT skills. In addition, factors such as cultural differences, language proficiency levels, and educational approaches can vary significantly across different contexts, affecting the effectiveness of concept mapping as a teaching strategy.

The general purpose of the study is to investigate the effectiveness of concept mapping as a pedagogical tool in enhancing CT skills in the context of secondary school Argumentative writing among Malaysian ESL learners. The study will focus on secondary school students from a government school in Kampar, Perak where English is Learned as a

Second Language. The study will be conducted over the course of 7 weeks with 14 lessons where Concept mapping will be implemented to assess the impact of the tool on CT skills. The study will investigate concepts and theories related to Concept Mapping, CT skills and Argumentative writing in the context of the ESL classroom.

1.6 Theoretical framework and Conceptual framework

This subtopic will cover the theoretical underpinnings that inform the research methodology and analysis. The theories selected for this study under this subtopic will then serve as a guide for the interpretation of data and the exploration of research questions.

1.6.1 Theoretical framework

The current research framework (as seen in Figure 1) is based on a few fundamental learning theories, teaching strategies and learning approaches where connections can be drawn in the teaching of writing. The theoretical framework is adapted from Maekong (2015) to suit the specifications of this study. The Cognitive Process theory of writing has been employed in the planning process of writing. Meanwhile, Ausubel's meaningful learning theory serves as the foundational theory for the writing process. The schema theory (prior knowledge), cognitive processes and second language acquisition theory are needed for students using concept mapping in the learning stage.

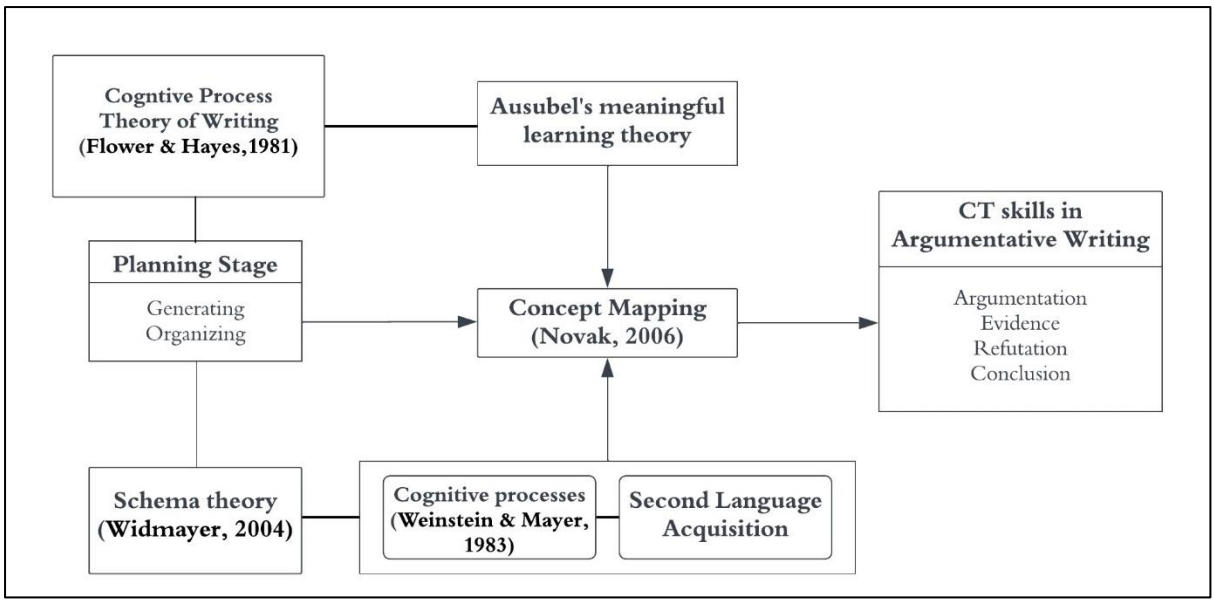


Figure 1 Theoretical Framework adapted from Maekong (2015)

The primary theory utilized is Flower and Hayes' (1981) Cognitive Process Theory of Writing, which suggests that writing involves distinct cognitive processes utilized by writers during the planning phase. In this study, the planning process entails sub-processes such as generating ideas and organising. In the process of generating ideas, students retrieve information that are relevant from the long-term memory to be used. The organizing process helps writers categorize information, find related ideas to expand on the topic, and identify broader concepts that encompass the main idea. In this study, the theory enables students to develop a topic towards the end goal of reaching the audience through writing and write through the employment of concept maps in the planning stage.

Novak's (2006) postulation of concept maps were based on Ausubel's meaningful learning in the construction of new information. Essentially, through assimilation, learners integrate new concepts into their existing knowledge frameworks. There is also a focus on teaching methods that highlight the connection between new information and what the learner already knows to promote meaningful learning. Thus, this highlights the importance of prior knowledge in promoting meaningful learning experiences.

However, there arises some concerns as to the role of prior knowledge during the planning stage in writing. Bahgat (2021) highlighted the role of educators in the language classroom in addressing learner-related aspects like language anxiety and background knowledge. This is due to the strong relation between prior knowledge as a meta-cognitive aspect of learning particularly in the brainstorming or pre-writing process. Therefore, the researcher suggested that teachers should strive to create an interactive classroom where corrective and prompt feedback is given priority. In terms of the current study, the teacher may play a role in facilitating brainstorming activities using concept mapping particularly in the pre-writing stage where prior knowledge activation is required. Prior knowledge may also be supplied through reading materials before the class.

The goal of writing for learners in this study is towards argumentative writing. As opposed to a hierarchical arrangement of knowledge in the schema, knowledge in the Schema theory are proposition networks, are meaning- driven and are actively constructed (Widmayer, 2004). According to Halliday & Hassan (1989), schemata can manifest in the organization and arrangement of textual content. Hence, in this study, learners will be exposed to argumentative essays as a source of schemata in which they may analyse and retrieve information regarding the general structure of argumentative texts, as well as generate more ideas and information based on information given to them. The schema theory also serves as an implication to be more aware of cultural references in materials presented to students, such as avoiding detailed topics related to the Western culture when the setting of the study is in Malaysia.

Upon retrieving prior knowledge, the combination of cognitive processes and the Second Language Acquisition (SLA) theory comes into play. According to Weinstein & Mayer's (1983) four-step encoding process, new information is acquired through *Selection, Acquisition, Construction* and *Integration.* In *Selection*, learners select specific information

from their surroundings in which the information is transferred to their working memory, followed by the transference to the long-term memory permanently (*Acquisition*). The *Construction* stage involves learners actively forming connections between ideas in their working memory. Lastly, learners retrieve prior knowledge from their long-term memory and use it in their ongoing learning process (*Integration*). This shows connection between the cognitive processes involved and prior knowledge. The Construction stage also aligns with the foundations of concept mapping as a cognitive strategy as learners are actively contructing meaning through concept mapping as a mind tool. In relation to SLA, Krashen's (1992) input hypothesis where comprehensible input also comes into the picture for L2 learners. Therefore, this hold implications as to the materials chosen for the learners particularly in the level of difficulty. Thus, the material chosen for this study will be centred around topics students are familiar with.

The current study aims at helping learners to enhance their CT skills through the utilisation of concept maps as metacognitive tools. Thus, when students employ concept maps in their writing, students may be able to improve their CT skills such as Argumentation in their writing.

1.6.2 Conceptual framework

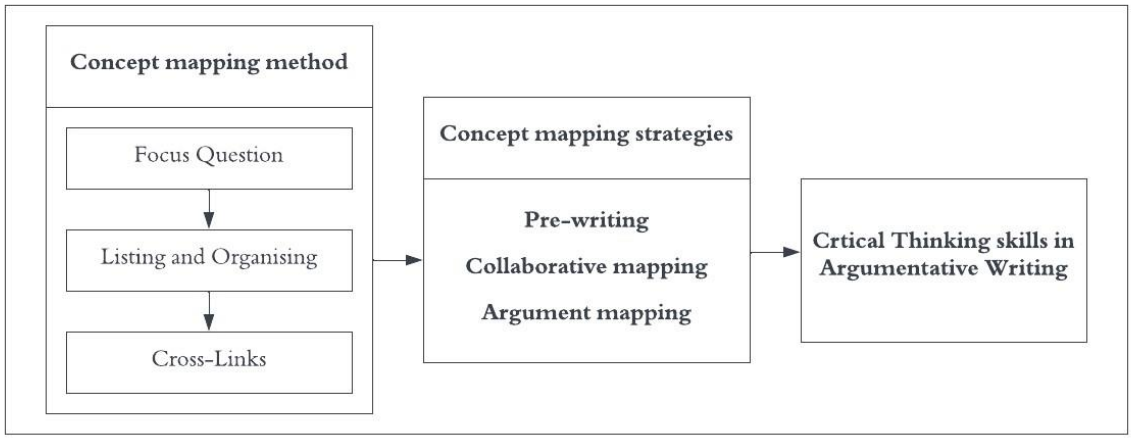


Figure 2: Conceptual Framework adapted from Maekong (2015)

The current conceptual framework is adapted from Maekong's (2015) similar study. The framework is based on foundational methods of concept mapping from Novak and includes strategies in carrying out concept mapping in ESL writing instruction for argumentative writing. Both concept mapping methods and concept mapping strategies will be integrated into lesson plans about argumentative writing. In this study, the teacher's role as an instructor and facilitator is pivotal in teaching and guiding students in the concept mapping method.

In constructing good concept maps, Novak (2006) highlights the construction of a Focus question which is the main and specific question that highlights the issue it aims to address. Learners tend to stray from the main question which often results in creating maps that are related to the subject-matter, but does not directly answer the question at hand. This highlights the role of teachers in making sure that learners stay aligned with the focus question in order to create effective concept maps that address the real issue.

Novak suggests listing 15 to 25 concepts in identifying relating key concepts. The ideas are then to be ranked from general to specific. Concepts that have no good connection with the focus question will then be left behind and attention can be placed on concepts with strong connections. Although Novak's method enables students to list concepts freely, listing such a large number may be excessive for essay writing purposes as these methods stemmed from the field of science. As another alternative for listing and organizing, the researcher suggests narrowing down the listing to main ideas. This is corroborated by Zarina & Fatimah's (2017) study, where concept maps were used in construction of specifically topic sentences in MUET essays.

After listing and organizing, learners may then begin the draft the preliminary map. Links that connect the different ideas (Cross-links) may then be added to view the relationships between the ideas. Suggestions to add linking words on the cross-links were

also given in order for students to see that all concepts are interrelated. After the cross-link stage, students may then revise or reposition domains within the map.

With the concept mapping method as a basis for the construction of concept maps, the teacher may then include the method into concept mapping strategies such as the use of concept maps or mind maps in pre-writing activities, collaborative mapping activities and argument mapping activities in the writing class. Based on existing concept mapping research, CT and writing, it is believed that these strategies will implicitly lead to the enhancement of CT skills in argumentative writing.

1.7 Operational definitions

English as a Second Language (ESL): Students in Malaysia learn English as a Second Language in the classroom, often with their mother tongue as a first language spoken more frequently or at home. English holds the position of being the second most widely spoken language in Malaysia, following Bahasa Malaysia. (Foo & Richards, 2004).

Concept mapping – Concept maps are graphic organisers that draw relationships between concepts and are used as a strategy in facilitating critical thinking (Harris & Zha, 2013). Mindmapping may be used alongside Concept mapping for teaching writing where notes are extended from a main idea (Marashi & Kangani, 2018).

Argumentative writing – Argumentative writing involves providing factual evidence to support one's claim in writing (Alex, 2022). An argumentative essay usually consists of an introductory section containing a thesis statement. This is followed by body paragraphs presenting arguments, counterarguments, and supporting evidence, and is concluded with a summary.

Critical Thinking (CT) - Critical thinking comprises component skills such as analyzing arguments, drawing conclusions through inductive or deductive reasoning, assessing or evaluating, and problem-solving or decision-making (Lai, 2011).

Meaningful learning – The learner chooses willingly to relate new information to prior knowledge in a meaningful manner by linking relevant concepts into the long-term memory. (Ausubel, 1968)

Autonomy – The learner's ability to take control of their own learning process. Learners play an active and central role in the discovering and learning process (Agra et al., 2019).

1.8 Summary

This chapter has introduced the background of the study in which Concept mapping, CT skills and Argumentative writing are interrelated and relevant in the context of Malaysian ESL learners. It has also covered the aims of this study which is to identify the extent to which Malaysian ESL students use CT skills in argumentative essays (RO1) and to determine whether the use of concept mapping contributes to the enhancement of CT in argumentative writing among Malaysian ESL students (RO2). The significance of the study has also been discussed for various stakeholders including educational institutions, teachers, and students. The main theories covered in the theoretical framework include Ausubel's meaningful learning theory and the Cognitive Process of Writing theory. The conceptual framework drawn was based on the Concept mapping learning method and expands to CM strategies and CT skills in Argumentative writing.

CHAPTER 2: LITERATURE REVIEW

This section covers the literature review of the study. It covers areas such as the Concept mapping learning method and its underlying theories, Critical Thinking, Strategies to incorporate Concept mapping into writing and the Assessment of Critical Thinking in Writing.

2.1 Concept mapping learning method

Concept mapping was first introduced by Novak (1990) and is essentially graphical diagrams or organisers that depicts relationships between concepts. The researcher highlighted the 2 main roles of concept maps in teacher education: (1) moving away from rote learning and moving towards meaningful learning, and (2) being skilful in the use of metacognitive tools. The arrangement of a concept map depends on how the abstract concept is logically structured, and it can take various forms such as chronological, hierarchical, flow chart, spider, and systems maps. According to Harris & Zha (2013), system maps are more ideal in facilitating critical thinking as compared to hierarchical, chronological, spider and flow charts as it uses symbols to represent different aspects of a complex idea, and it show its parts relate to each other. In addition, it is useful for connecting theory with real-world use.

2.1.1 Underlying Theories of concept mapping

Novak (2006) postulated 2 main theoretical foundations behind Concept mapping.

1)Psychological foundations

Concept mapping is based on the theory of meaningful learning by Ausubel and memory. In meaningful learning, 3 conditions must be met: 1) The information should be easy to understand and use relevant examples. 2) The learner must have background knowledge, 3) The learner must voluntarily and consciously learn meaningfully. In terms of memory, all memory systems are interdependent and incoming information is processed and organized

through the interaction of the existing information and prior information in the long-term memory. Concept mapping is effective because it acts as a scaffold, and aids in the organization and structuring of knowledge, even as it's constructed incrementally in the working memory. Thus, teachers may leverage the tool to promote meaningful learning in the classroom.

2)Epistemology foundations

Based on the theory of constructivism, meaningful learning can occur through the creation of new knowledge. The learner constructs new meaning through existing knowledge and the drive to create new representative meanings. In other words, when learners engage in meaningful learning experiences—where they actively construct understanding based on existing knowledge and make connections between new information and prior experiences—they are also participating in the broader process of generating new knowledge and advancing their understanding of the world.

2.1.2 Concept map applications

Concept mapping applications have made its way in K-12 education, higher education and professional development. In a study by Chang, Hwang & Tu (2022), the researchers conducted a systematic review of research published in seven journals indexed in the Social Science Citation Index (SSCI) to investigate the utilization of concept maps in technology-enhanced learning settings for K-12 education. Findings revealed that concept maps were predominantly utilized as personal and collaborative Mindtools in elementary schools, with elementary school teachers employing them for both group learning and individual student use, whereas secondary school teachers primarily employed concept maps as an assessment tool. In higher education contexts, Machado & Carvalho (2020) found that concept maps foster critical thinking, facilitate meaningful learning, promote technology integration,

encourage collaboration among students, and can enhance academic performance among undergraduate students. In professional development, lots of attention has been given to concept mapping in nursing education as it promotes CT, problem-solving skills and helps nursing students draw interrelationships in patients' health issues (Hicks-Moore, 2005).

Relating to the present study, concept mapping has also made its way into ESL and EFL contexts such as for pre-writing (Su & Zou, 2022), writing (Ahmed, 2020), reading comprehension (Ta & Razali, 2023), vocabulary (Keysan & Larsari, 2022), listening (Boroumand, Mardani& Khakzad Esfahlan, 2021) and speaking (Chen & Hwang, 2020). Hence, this study aims to further investigate the effectiveness of concept mapping in enhancing language learning outcomes within the ESL writing contexts, particularly in CT and Argumentative writing.

2.2 Critical thinking

There has been a plethora of definitions of Critical thinking over the past century. Some scholars on had proposed that the definitions of CT were too vague and lack a clear definition (McPeck 1990, Atkinson, 1997). Nevertheless, there are a few areas we can refer to for definitions. Scholars taking the philosophical approach like Paul & Elder (1992), defines CT as analysing and evaluating our thinking with the aim to improve or 'perfecting it, and emphasizes the qualities a good critical thinker should have (Lewis & Smith, 1993). In the educational approach, Dewey (1910) defines Critical thinking as 'Reflective thought' or 'Reflective thinking' which constitutes the active and thorough consideration of presumed knowledge, focusing on the supporting evidence and subsequent implications. The cognitive psychological approach on the other hand, focuses more on how thinking is done and its observable behaviours, emphasizing on the process and decisions made (Sternberg, 1986).

Despite the abundance of listed skills under scholars of each approach, the 3 areas agree on a few abilities as summarized by Lai (2011):

- Examining arguments, assertions, or supporting evidence
- Drawing conclusions through either inductive or deductive reasoning
- Assessing or appraising
- Formulating decisions or resolving problems
- Seeking clarification
- Seeing both sides of an issue

In the education field, scholars have worked on formulating ways in which CT instruction can be used in the classrooms. In 1956, Bloom came up with the taxonomy of skills pertaining to information processing, one of the most frequently referenced sources in educational settings to teach and assess thinking skills. Although this conceptualisation was said to be problematic by Ennis (1993) due to the concepts being too vague to be used in assessments or to serve as a guide for teachers, the taxonomy has proven to be useful and remains relevant even in recent years. There have also been discussions about what CT skills should be taught, specifically through the postulation of taxonomies such as taxonomies cited in Lai (2011) by Kurfiss (1988), Facione (1990), Halpern (1998), Kuhn (1999) and Alwehaibi (2012).

Among the debates of what skills should be taught, there are also debates about how it should be taught. Some notable methods include problem-based learning, collaborative learning, questioning techniques, discussion, reading and the incorporation of technology such as Web-based learning (Lai, 2011). Concept mapping also emerges as one of the methods and strategies to enhance critical thinking as it encourages meaningful learning, and it helps learners connect and organise new information (Chabeli, 2010). In the Malaysian

educational setting, it is important to consider the feasibility of the CT teaching methods. In a study by Alih, Raof & Yusof (2021) investigating Malaysian teachers' perception of the implementation of the CEFR policy change, many teachers cite the challenges in the school setting such as the lack of facilities, the lack of time and particularly, the students' low proficiency levels. Given that concept mapping is a simple method of drawing connections of ideas through diagrams, it presents a promising solution to address some of the challenges in the teaching process. By leveraging concept mapping in ESL writing, teachers can facilitate critical thinking and meaningful learning while coping with the ongoing challenges in the Malaysian ESL classroom.

2.3 Processes involved in Writing

It is important to consider the processes and theories involved in writing. Writing involves a series of cognitive processes. Flower and Hayes' (1981) Cognitive Process theory of writing entails that during the planning phase, the sub-processes of generating ideas and organising are involved. These processes are necessary for students to write effectively.

Prior knowledge is also relevant in writing. The Schema theory (Widmayer, 2004) which suggests that knowledge is arranged in networks and are meaning driven instead of hierarchical also comes into play. Learners need to relate new information with their prior knowledge in order to make meaning of the new information.

Weinstein & Mayer's (1983) postulated that new information is acquired through a four-step encoding process, namely: Selection, Acquisition, Construction and Integration. This four-step process draws a connection between processes involved in writing and prior knowledge needed for writing. In addition, SLA comes into play. Krashen's input hypothesis suggests that learners require comprehensible input where language is the most ideally acquired when the input material is a level higher than what the learners know. Thus, it is

evident that effective writing involves complex connections between cognitive processes, prior knowledge activation, and language acquisition theories. These relate to the use of Concept maps as all these processes are involved in the planning stage of writing.

2.4 Strategies for Integrating Concept Mapping into Writing

There are many ways to integrate concept mapping into ESL writing instruction. For this study, the researcher will outline 3 strategies:

2.4.1 Pre-writing Concept mapping

Essentially, students are required to brainstorm ideas in the form of concept maps before the writing tasks. According to Al-Shaer (2014) who implemented this strategy in order to help learners of the EFL context generate better ideas, the researcher highlighted the benefits of including Concept mapping at the Pre-writing stage for a better generation of ideas in terms of: point of view, development, unity and coherence, thinking and organisation. Under pre-writing concept maps, there are 2 methods to execute this:

2.4.1.1 Fill-in-the map

The teacher provides a skeleton map in which students are required to fill in blank spaces where some concepts and/or words linking such concepts were excluded (Ruiz-Primo et al., 2001).

2.4.1.2 Constructing maps from scratch

The teacher might offer concepts or terms and request students to create either a hierarchical or non-hierarchical map on a blank sheet of paper (Ruiz-Primo et al., 2001). However, this method might be considered problematic as it consumes more time and students may lack the education to create such maps.

2.4.2 Collaborative concept mapping

This strategy promotes a collaborative learning environment in which students may learn from one another, especially in terms of the differences in ideas. It engages 2 or more students in the construction of knowledge through one or more concept maps which can help build a common ground among learners (Gao et al., 2007). A study by Khodadady & Ghanizadeh (2011) that employed Concept maps as a post-reading strategy implemented the step of exchanging concept maps and discussing any controversies present. The strategy not only promotes collaborative learning but also encourages students to engage in critical discussions and knowledge exchange by sharing their interpretations and clarify and misconceptions about the text.

2.4.3 Argument mapping

Davies (2011) draws a distinction between concept mapping, mind-mapping and Argument mapping. He suggests that argument maps can be utilized to defend certain claims and that there are certain levels in the hierarchical map including: contention, co-premises, supported by claims and basis boxes (see Figure 3). Objections and rebuttals may even be added, and the researcher suggests the basis that the map is never ‘complete’ as more ideas can always be added.

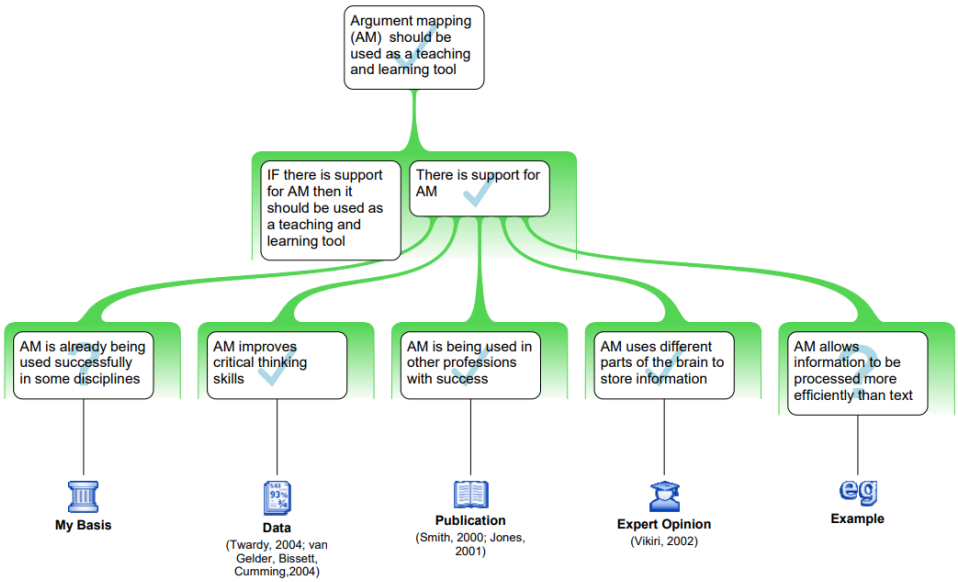


Figure 3: Example of an argument map adopted from Davies (2011)

In using argument mapping as a teaching and learning tool, it is more concerned with having an inferential basis to the claims instead of causal links. Davies also highlights the advantage in how it is arranged in sub-relationships such as making logical inferences. Overall, it emphasises on the supporting of ideas with proper evidence which is relevant in this study pertaining to Argumentative writing.

In this study, the researcher will be employing a mixture of the strategies as in the study by Khodadady & Ghanizadeh (2011) where strategies were incorporated in the implementation methods.

2.5 Assessment of Critical thinking in Argumentative writing

Assessing critical thinking in writing is a fundamental aspect of teacher evaluation. Ennis (1993) suggested that answers should be open ended due to it being more comprehensive as compared to Multiple-choice questions.

Argumentative essays are considered one of the methods in assessing critical thinking due to the strong relationship between Argumentation and CT. According to Marni Suyono,

Roekhan & Harsiati (2019), although CT and Argumentation are two different things, both stem from the same family scientifically, that is through informal logic. The researcher also highlighted that argumentation is a manifestation of CT. Therefore, argumentation is often used as a tool to measure CT (Stupple et al., 2017). This is corroborated in many past studies that employ argumentative essays to develop CT skills. A study by Soodmand, Movassagh and Radi Arbabi (2017) examined how critical thinking relates to the writing proficiency in Iranian EFL learners and the interconnectedness of their subskills. Additionally, it aimed to identify which CT skills best predicted participants' writing abilities. Results showed a significant correlation between critical thinking and writing ability, with analysis and evaluation emerging as the most influential predictors of writing proficiency among the critical thinking components. Besides that, Sharadgah, Sa'di & Ahmad's (2019) study investigated the effectiveness of promoting CT skills by employing argumentative essay composition among students majoring in English in a quasi-experimental design. Results indicate a significant positive correlation between CT and essay-writing skills, with the intervention group showing notable improvement in interpretation, analysis, evaluation, inference, and explanation. In Wale & Bishaw's (2020) study examining the effects of inquiry-based learning on CT skills, the researchers employed argumentative essays in through the administration of 3 argumentative essays among EFL students. Findings reveal that using inquiry-based argumentative writing instruction enhances students' critical thinking skills, particularly in interpretation, analysis, evaluation, inference, explanation, and self-regulation.

The aforementioned studies focus the use of argumentative essays in developing CT skills except for the one by Wale & Bishaw (2020) that incorporates inquiry-based learning. Thus, the present study aims in looking into the significance of using Concept maps to see if there is any enhancement of CT skills in argumentative essays.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter will cover the research design of the study, sample and sampling procedures, research instruments used, research and data collection procedures and ethical considerations of the study.

3.1 Research Design

This section highlights the research design of the study which mainly addresses the nature of the research and its justifications. Generally, it covers the approach (quantitative) of the study, the design (experimental) and why it was chosen.

This study employs a quantitative approach through the utilisation of a pretest-posttest control group design (Brogan & Kutner, 1980) to assess the impact of Concept maps on students' CT skills in Argumentative writing. There are a few types of quantitative methods in research such as experimental, non-experimental and descriptive research (Mohajan, 2020). In this study, we focus on the experimental design which involves pre-tests and post-tests for both control and experimental groups. The quantitative approach was chosen as it is most appropriate in answering the research questions of this study. Quantitative research focuses on measurable and predicable parts of human behaviour instead of focusing on interpreting behaviour due to certain actions (Rahman, 2020). As the main purpose of the research is to measure the effectiveness of Concept mapping in the enhancement of CT skills in Argumentative writing, the quantitative approach is appropriate as it deals with the comparison of pre-test and post-test scores. According to Rasinger (2013 as cited in Rahman, 2020) quantitative methods answer questions in regards to 'how many', 'how much' and 'to what extent' which is highly relevant in this research. For example, RQ1 in this research deals with how much improvement in CT skills there is in the participants' argumentative

writing. Thus, the quantitative approach was chosen as it best measures the enhancement of CT skills in Argumentative writing of ESL students.

Quantitative data in this study will be obtained from the pre-test and post-test of both control and experimental groups. Before the study, both groups will then be given a pre-test which is to write an Argumentative Essay of at least 300-350 words based on contemporary issues. The word count of 300-350 words was set because this is the typical word count assigned in national examination papers like SPM. The topics of contemporary issues covered will be based of textbook topics that the learners are exposed to in the class. The essays will then be scored based on the Illinois Critical Thinking Essay Scoring Rubric adopted from Finken (1992) (See more about the rubric under **3.3 Research Instruments**). Next, the experimental group will undergo writing instruction with the use of the concept mapping technique. The control group continues lessons with traditional writing instructions. After the intervention period, both groups will undergo the post-test (writing the 2nd essay) in which the essays will be graded using the same scoring rubric. Quantitative data in this study obtained from the results of the pre-tests and post-tests scores will then be analysed.

The research design was chosen due to data collection occurring within standard school conditions where students are assigned to their designated and intact teaching classes. As the research is planned to be conducted during the researcher's teaching practical period, the experimental design coupled with purposive sampling is deemed most appropriate as the researcher does not have the authority and autonomy to choose classes to be taught. Furthermore, this research design is also consistent with previous studies that employ pre- and post-tests in evaluating CT and Argumentative Writing (Nejmaoui, 2019; Sharadgah, Sa'di & Ahmad, 2019; Murtadho, 2021)

3.2 Sample and Sampling Procedure

This section covers the sample, sampling methods, procedures and its justifications.

Due to logistical and time constraints, random assignment may not be feasible. Therefore, in terms of sampling method, purposive sampling will be employed to select participants. Purposive sampling was chosen due to its practicality and efficiency in accessing students. Two intact classes from a secondary school in Kampar, Perak district will be chosen as it is most accessible to the researcher. The target school will be a government secondary school in which proficiency levels are expected to be at low to intermediate. Utilizing intact classes allows for a convenient and feasible approach to obtain a sufficient sample size while maintaining the integrity of the group dynamics within each classroom. The sample will be consisting of students with varying English proficiencies.

The proposed participants will be Malaysian ESL secondary students from two intact classes. The total number of students estimated from both groups will be around 50 students. Form 5 classes will not be chosen for this study as introducing an intervention program is seen as a significant burden to schools, teachers and the Form 5 students as they are bound to undergo the national high-stakes examination which is SPM. Thus, two random classes from the same form of a government secondary school will be chosen for this study.

3.3 Research Instruments

This section outlines research instruments that will be used in the study in regards to the measurement of CT skills in writing. It involves a description of lesson plans that will be used in the classroom for writing lessons during the study and how essays will be graded.

The lesson plan template in lessons throughout this study will be taken from the Kurikulum Standard Sekolah Menengah (KSSM) that is available to the researcher during the teaching practicum. It generally includes details of the lesson like Theme, Topic, Content and Learning Standards, Grammar component, lesson outcomes and objectives. A lesson under the KSSM format is divided into different stages comprising Set Induction, Presentation,

Practice, Production and Closure. Participants will undergo a total of 14 lessons (7 weeks) during the intervention stage.

3.3.1 Lesson plans based on Concept mapping strategy to teach Argumentative writing

The lessons incorporating the Concept mapping strategy will include Concept mapping, argument mapping and mind mapping in the Pre-writing and brainstorming stages, as well as collaborative mapping where students will collaborate to produce maps of main ideas and supporting ideas of the essays. The topics chosen will be in alignment with the teaching syllabus of Form 3 students (Refer to Appendix A for sample of lesson)

3.3.2 Lesson plans based on traditional methods to teach Argumentative writing

Similar to the lesson plans based on the Concept mapping method, traditional methods of teaching Argumentative writing in the classrooms. Traditional methods will cover listing ideas and approaches of teaching writing such as the process and product approach (Refer to Appendix B for sample of lesson)

3.3.3 Illinois Critical Thinking Essay Scoring Rubric (Finken, 1992)

The Illinois Critical Thinking Essay Scoring Rubric is derived from Finken and Ennis's Illinois Critical Thinking Essay Test (ICTE Test). This rubric is typically used as an evaluation tool in measuring CT in essays and is also highly useful in assessing the development of CT skills (Zubaidah, Mahanal & Fauzi, 2020). The rubric consists of six grading criteria, namely: *Focus, Supporting Reasons, Reasoning, Organization, Conventions* and *Integration*. The mentioned features are rated on a six-point scale each. Scores may range from 6 points (lowest) to 36 points (highest). Each aspect contains descriptions about grading criteria of the writing (Refer to Appendix C). However, for this research, all features except *Conventions* will be used as the *Conventions* feature is more related to language mechanics rather than CT. Thus, the researcher will utilise this rubric in the grading process of essays to

gauge the CT levels present in the student's argumentative essays in which the higher the score, the higher the levels of CT present in the student's argumentative writing, with a maximum score of 30 points.

3.4 Research Procedures and Data Collection Procedures

The research procedures in this study can be divided into three main stages of implementation: 1) Pre-intervention, 2) During Intervention and 3) Post-Intervention

3.4.1 Pre-Intervention

In the Pre-Intervention stage, the researcher will undergo a few things. Research ethics approval will be requested from the researcher's university (Universiti Tunku Abdul Rahman). Next, the researcher will plan the lessons for the intervention and traditional methods of teaching argumentative writing that will be used in the classroom. In this study, both control and experimental groups will undergo a total of 14 lessons (7 weeks) during the intervention stage. Before carrying out the experiment, the researcher will also get approval from the school to conduct the research. Consent forms will be distributed to the students to get approval for their participation. After that, a pre-test of writing an Argumentative Essay will be conducted and results will be graded using the Illinois Critical Thinking Essay Scoring Rubric (1992).

3.4.2 During Intervention

During the intervention stage, the researcher will implement the intervention on the students. The students from the experimental group will undergo the intervention of using concept mapping in their argumentative writing. Students from the control group on the other hand will be undergoing traditional writing lessons.

3.4.3 Post-Intervention

For the last stage, the students will undergo the same post-test which is writing the second essay which will be scored with the same rubric to measure the CT levels in their writing. The researcher will then conclude the experiment and thank the school and students for their participation. A small compensation in the form of stationery will be given to the participants as a form of gratitude.

A summary of the research procedures can be found in the table below:

Stage	**Description**
Pre-Intervention	1) Requesting research approval from the university 2) Planning lessons for the intervention and traditional methods of argumentative writing 3) Getting approval from the school to conduct research 4) Distributing consent forms to participants 5) Conducting the pre-test of writing the first essay
During Intervention	1) Implementing the intervention for the experimental group 2) Carrying out traditional lessons in control group
Post-Intervention	1) Conducting the post-test of writing the second essay 2) Concluding the research by thanking the school and students for their participation and compensating the participants.

Table 1: Research procedures

3.5 Data Analysis

This section outlines the methods of analysis for the quantitative data of this study. Quantitative data in this study were obtained from the results of the pre-tests and post-tests scores of the participants.

The data from the pre-tests and post-tests scores were used to answer the research questions in this study. The main methods of analysing the quantitative data in this study is through descriptive statistics and paired samples t-tests to see if there is a significant difference among the experimental and control group. The researcher utilised the Statistical Package for the Social Sciences (SPSS) software package available in the university to carry out the paired samples t-test.

The essays for the pre-test and post-test scores were graded based on the Illinois Critical Thinking Essay Rubric, where the scores will be out of a total of 36 points. Before the calculations are made, the researcher will have to ensure that the data from the pretest and posttest scores are complete, accurate and error free. In addition, the researcher has to check for any missing values that may impact data analysis. Thus, multiple checks will be carried out to ensure a smooth data analysis.

According to Ross & Willson (2017), a paired samples T-test is used to compare the averages of two matching groups or that of a single group within two distinct points in time. In this study, paired samples t-test is deemed to be appropriate as it allows for a direct comparison of scores within the same group and with the other group of participants.

3.6 Ethical Considerations

There are several things to consider in terms of ethics within this study. Firstly, it is important to obtain informed consent from the students and the school for the participation of this study. The researcher has to ensure that the students and the school authorities understand the

purposes of the study, their rights as participants, any potential risks or discomforts involved, and the voluntary nature of their participation before they agree to participate in the study.

Confidentiality should also be highlighted to the participants of the study. The researcher can provide clarification on how the data will be used and assure the participants that data obtained will be confidential. The researcher will explain how the data will be handled and that the information will be handled with care. The researcher will also ensure anonymity of the participants' data by not revealing their names or their essays.

Lastly, the researcher will consider any potential for harm that may occur during the study. This could include topics that would be covered in the essay writing. For example, the researcher will avoid sensitive topics related to religion, ethics and family issues to prevent any triggers of psychological harm to the students when they write their essays. The researcher will ensure all topics are revised thoroughly with the supervisor of the researcher to ensure appropriate topics are chosen.

In conclusion, not only does the researcher aim for the study to be a success and benefit the education community, but also to be conducted in an ethical manner. Through informed consent, confidentiality and considerations for potential harm, the researcher aims to carry out a study that has dignity and integrity in its conduct.

3.7 Summary

The study employed quantitative methods with an experimental design. 40 students from a secondary school in Perak, Malaysia were selected via purposive sampling. A paired samples t-test was conducted via SPSS. Some ethical considerations were proposed.

CHAPTER 4: FINDINGS AND ANALYSIS

This chapter presents the findings and analysis of the results in relation to the research questions postulated in Chapter 1. This study aimed to investigate whether the use of CM enhances CT skills in argumentative writing among Malaysian ESL students (RQ1). It also sought to determine the levels of CT skills in students' argumentative essays after CM was introduced (RQ2).

4.1 Findings and Analysis

To examine the impact of using CM in enhancing CT skills in argumentative writing, the researcher conducted a pre-test and post-test with both the experimental and control groups. The argumentative essays produced by the participants were evaluated anonymously and meticulously by the researcher, using the Illinois Critical Thinking Essay Scoring Rubric developed by Finken and Ennis (Finken, 1992). The resulting scores were analyzed using Descriptive statistics and Paired Samples t-test via SPSS.

To answer the first research question (RQ1), the researcher employed Statistical Package for the Social Sciences (SPSS) to conduct a statistical analysis. Specifically, a paired-samples t-test was used to compare the mean scores of CT skills in the pre-test and post-test essays between the experimental group (using CM) and the control group (not using CM). Given that the research involves statistical analysis, particularly the testing of statistical significance for the quantitative data, the use of null hypotheses (Wiersma & Jurs, 2005) is necessary. The null hypothesis is postulated as below:

> H_0 (Null Hypothesis): There is no significant difference in critical thinking skills in argumentative writing among Malaysian ESL students with or without the use of Concept Mapping.

This hypothesis was evaluated in comparison to the alternative hypothesis:

H_a (Alternative Hypothesis): There is a significant difference in critical thinking skills in argumentative writing among Malaysian ESL students with the use of Concept Mapping.

The results of the statistical analysis will determine whether the null hypothesis can be rejected in favour of the alternative hypothesis. This in turn provides insights into the impact of Concept Mapping on enhancing CT skills in argumentative writing among Malaysian ESL students.

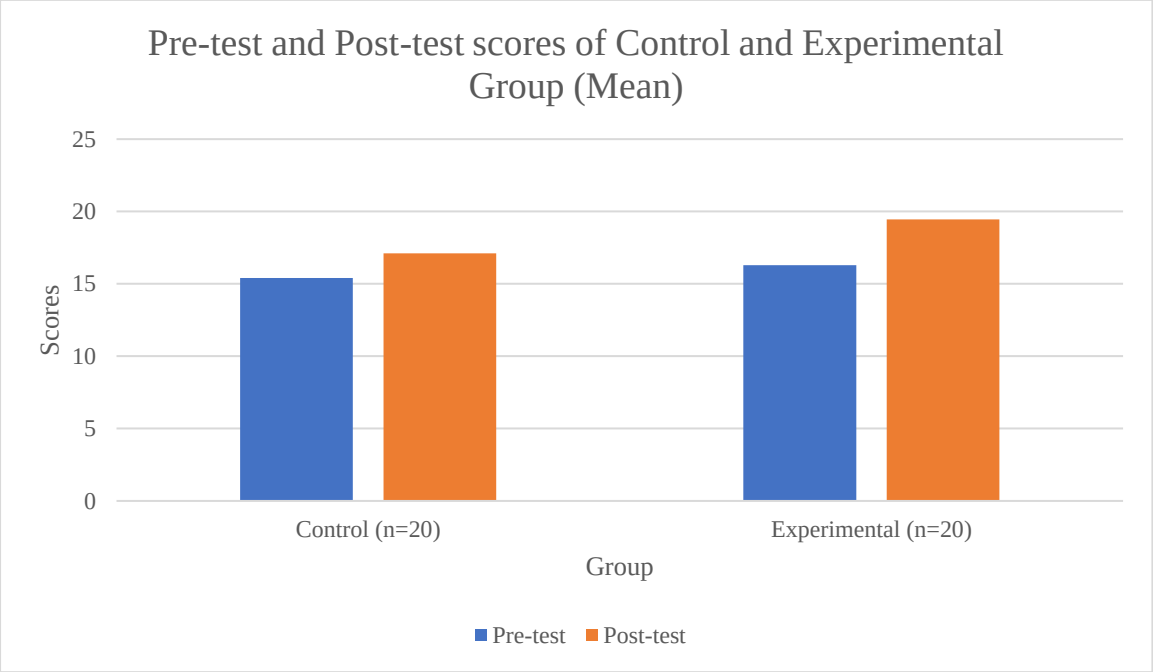
To answer the second research question (RQ2) on the other hand, the researcher analysed the average scores from the essays based on the different CT skills in the Illinois Critical Thinking Essay Rubric.

4.1.1 Pre-test and Post-test scores

The figure below shows an overview of the data obtained from the Pre-test and Post-test scores from the Control and Experimental Group

Figure 4

Pre-test and Post-test scores of Control and Experimental Group



Generally, there is an increasing trend across both groups with a higher increase in the Experimental Group. Participants in the Control Group depicted an increase in mean score from 15.40 to 17.10 (difference=1.7) whereas the Experimental Group had an increase from 16.30 to 19.45 (difference= 3.15).

The following tables present the descriptive statistics of the data. Table 2 and 3 depict the Pre-test and Post-test scores of the Experimental Group (EG) and Control Group (CG) in terms of mean and standard deviation.

4.1.1.1 Pre-test scores

Table 2

Pre-test scores

Group	Mean	Standard Deviation
Control (n=20)	15.40	2.81
Experimental (n=20)	16.30	2.29

Based on the data above, participants in the Control Group obtained a mean of 15.40 whereas the Experimental Group scored a mean of 16.30, just slightly above the average score of 15 points. The difference between the groups pre-test scores is only 0.9 which shows that the participants likely did not have much of a disparity in terms of CT skills before CM was introduced. The standard deviation across the Control Group and Experimental Group was fairly small (SD=2.81 and SD=2.29 respectively), which shows that the scores in both groups are not highly spread out from their respective means. This suggests that participants in both groups had relatively similar performance levels on the pre-test.

Generally, the groups possessed only an average level of CT skills in argumentative writing as evidenced by their mean scores just slightly above average (15 points).

4.1.1.2 Post-test scores

Table 3

Post-test scores

Group	Mean	Standard Deviation
Control (n=20)	17.10	3.37
Experimental (n=20)	19.45	3.95

In the post-test, the participants in the Control Group (CG) obtained a mean of 17.10, with an improvement of only 1.7. On the other hand, the participants in the Experimental Group (EG) showed a substantial improvement in mean score (3.15) from 16.3 in the pre-test to 19.45 in

the post-test. The standard deviation in post-test scores (SD=3.37 (CG) and SD=3.95 (EG) recorded a slight increase for both groups, which indicates that participants performance varied slightly more compared to the pre-test scores

To determine if the differences between the pre-test and post-test mean scores are significant, we need to look at the results of a Paired Samples t-test.

4.1.1.3 Normality tests

Before conducting a paired-samples t-test, the researcher ran the data through normality tests to check if the distribution of the scores in both the pre-test and post-test followed a normal distribution. The Skewness and Kurtosis values for both the Control and Experimental groups were examined to assess the normality of the data (Hatem et al., 2022).

Table 4

Normality tests

Test	Group	Skewness	Kurtosis
Pre-test	Control	-.095	-.559
	Experimental	-.090	-1.019
Post-test	Control	-.032	-1.358
	Experimental	-.110	-1.216

For both the Control and Experimental groups, the skewness values were close to zero (-.095, -.090, -.032 and -.110) indicating that the distribution of scores was roughly symmetrical. Although the Kurtosis values were negative, they were not extreme enough to suggest that the data deviated significantly from a normal distribution as it means the distribution may be slightly flatter than normal. However, the values were not large enough to raise concerns.

Given these results, the data appears to be approximately normally distributed. Therefore, it is appropriate to proceed with the paired-samples t-test.

4.1.2 The Enhancement of CT skills in Argumentative writing (RQ1)

To preview whether the paired samples are sufficiently related for the t-test to be valid and meaningful, a paired samples correlations was conducted.

4.1.2.1 Paired Samples Correlations

Table 5

Paired Samples Correlations of Control and Experimental Group

Groups (from pretest-to-posttest)	Correlation	Sig.
Control	.855	<.001
Experimental	.883	<.001

It was found that the Control and Experimental groups obtained a positive correlation of 0.855 and 0.883 respectively, with a p-value of <0.001, which highlights that the correlation is statistically significant. This suggests that, for both groups, participants who did well on the pre-test tended to also do well on the post-test. Therefore, it supports the idea that the pre-test and post-test scores are closely related.

In view that the paired samples correlations result was acceptable, the researcher can move on to the paired samples t-test.

4.1.2.2 Paired-samples t-test

Table 6

Paired-samples t-test of Control and Experimental Group

Group (from pretest-to-posttest)	Mean	SD	T	Df	Sig. (Two-sided p)
Control	-1.70	1.75	-4.344	19	<.001
Experimental	-3.15	2.20	-6.383	19	<.001

The results of the paired-samples t-test revealed that both the Control and Experimental Groups experienced statistically significant increases in their post-test scores compared to

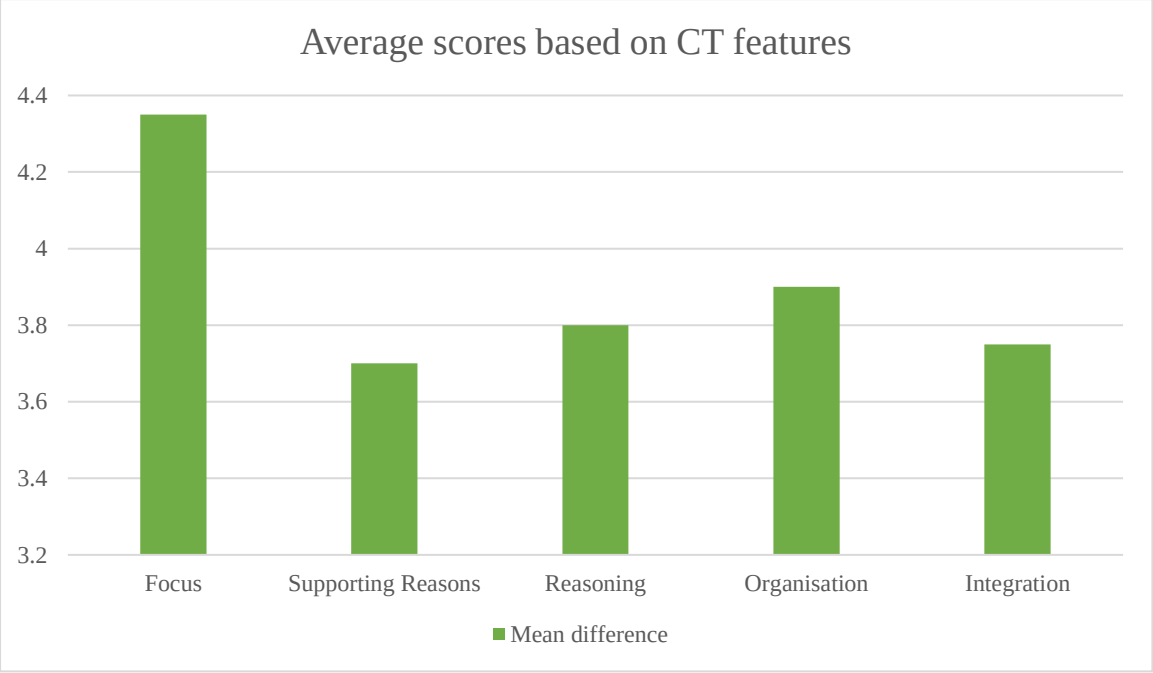
their pre-test scores. For the Control Group, the difference in mean scores (difference = -1.70) was statistically significant (t (20) = -4.344, p= <.001), as were the mean scores in the Experimental Group (difference= -3.15, t (20) = -6.383, p= <.001). While both groups improved, there was greater improvement in the Experimental Group due to the higher mean difference and t-value as compared to the Control Group. Since, the data is statistically significant based on the p-values, we can reject the null hypothesis (H_0) in favour of the alternative hypothesis (H_a).

4.1.3 The levels of CT skills in students' argumentative essays after CM was introduced (RQ2)

The figure below shows an overview of the CT skills in students' argumentative essays after CM was introduced based on the different features in the Illinois Critical Thinking Essay Test Rubric (excluding the feature *Conventions*).

Figure 5

CT skills in students' argumentative essays (Experimental Group)



The table below shows the levels of CT skills based on features in Illinois Critical Thinking Essay Test Rubric. The analysis was based on the scores given in the post-test following the CT features in the Illinois Critical Thinking Essay Test Rubric (excluding the feature *Conventions*). The average score of the different features was calculated and examined.

Table 7

Average score of CT skills based on Features in Illinois Critical Thinking Essay Test Rubric (excluding the feature Conventions) after CM was introduced

CT Skill/Feature	Average score
Focus	4.35
Supporting Reasons	3.7
Reasoning	3.8
Organisation	3.9
Integration	3.75
AVERAGE	3.9

Based on the table above, the average score for Focus was 4.35, Supporting Reasons was 3.7, Reasoning was 3.8, Organisation was 3.9 and Integration was 3.75. The highest average score was the CT skill Focus (4.35) whereas the lowest average score was in Supporting Reasons (3.7). The total average score of the CT skills was 3.9.

The findings reveal that CM significantly enhances CT skills in argumentative writing among Malaysian ESL students. Although both the Experimental and Control Groups showed an improvement, the Experimental Group obtained a greater improvement from their scores. Besides that, among the CT skills assessed in their essays, it was found that *Focus* emerged had the highest average score at 4.35, while *Supporting Reasons* had the lowest average score (3.7) after CM was introduced. These results suggest that incorporating CM in teaching ESL writing is beneficial in helping students develop their CT ability in writing as students in the Experimental Group outperformed the students who were not taught the CM method.

4.3 Summary

This chapter presented and analysed the findings related to the research questions of the study. It was found that the use of Concept Mapping (CM) significantly contributed to enhancing the Critical Thinking (CT) skills of the students in their argumentative writing with the Experimental Group achieving a mean difference of 3.15 in their pre- and post-test scores, compared to the Control Group that achieved a mean difference of only 1.70. Furthermore, the participants CT levels were found to be far from the well-developed stage with an average score of only 3.9 out of 6 points.

CHAPTER 5: DISCUSSION AND CONCLUSION

This chapter will discuss the findings and analysis from Chapter 4 and relate it to the literature review. Then it will provide some implications of the findings, the study's limitations, and suggest some future research directions that can be explored. It will also summarize the whole thesis and highlight the most important insights in the research.

5.1 Discussion

This section discusses the findings related to the research questions. This study aimed to investigate whether the use of CM enhances CT skills in argumentative writing among Malaysian ESL students (RQ1). It also sought to determine the levels of CT skills in students' argumentative essays after CM was introduced (RQ2).

5.1.1 The Enhancement of CT skills in argumentative writing through CM (RQ1)

Based on the findings, it was found that there was a greater improvement in mean score in the Experimental Group (Mean difference = 3.15) compared to the Control Group (Mean difference = 1.70). These findings confirm the hypothesis that CM contributes to the enhancement of CT skills in argumentative writing. The findings agree with Ausubel's meaningful learning theory which is one of the theoretical foundations of Concept mapping. When students create concept maps, it allows them to consolidate existing knowledge on a topic while incorporating new information in the process of their learning. This is because meaningful learning occurs most effectively when new ideas are integrated under broader, more inclusive concepts and CM arranges information and concepts from general to specific (Akinsanya & Williams, 2004). In other words, CM not only helps with deductive reasoning, but develops the critical thinking ability to synthesize information and look at the bigger picture. This is corroborated by a study by Alias & Suradi (2008) that found that using CM was highly beneficial in organizing and synthesizing information for a literature review,

particularly for students who find it challenging to do so. In the context of this research, students were able to improve in their ability to organise information and synthesise ideas for writing argumentative essays. The results not only highlight the benefits of CM but also underscore the importance of the organisation of information in understanding critical thinking.

The findings resonate with Bilik and Deveci's (2020) study where CM significantly improved nursing students' CT skills through web-based concept mapping education. Another study in Taiwan also echoes the current study's findings where, among 43 students in the Taiwan high school, the group tasked with constructing the concept map scored significantly higher than the group completing fill-in-the-map activities in critical thinking skills such as inference, interpretation, analysis, evaluation, and explanation (Tseng, 2020). A study by Astiantih & Akfan (2023) in Indonesia also revealed similar results. According to the researchers, after the CM method, students had good to excellent achievement in their writing skills. Most recently, a similar study was conducted by Daeng and Enre (2024) that revealed the effectiveness of CM in enhancing CT skills in argumentative writing specifically. In the study, the quantitative findings revealed that there was an improvement in proficiency in writing skills whereas the qualitative findings highlighted an enhancement in CT skills among the students. This can be supported by Muin and Kurniati's (2022). findings where there was an improvement in overall average score in students' writing although there was no full mastery of the skills. These findings collectively underscore the effectiveness of concept mapping in enhancing critical thinking and writing skills across diverse educational contexts, not only in the ESL context, but also in the EFL context

Looking at the ESL context of Malaysia, the results also suggest that CT can be developed and taught in ESL writing instruction. This can be interpreted as evidence that integrating CT strategies like CM into language learning not only enhances students' ability

to analyze and organize their thoughts but also improves their overall writing skills. These findings expand our understanding of how CM can facilitate deeper cognitive engagement and better articulation of ideas in L2 writing. According to Mah et al. (2013), despite having studied English for over 15 years, Malaysian L2 learners remained incredibly weak in both writing skills and cognitive development. The researchers highlighted the gap in L2 writing instruction and brought up the conflicts in approaches to writing (process, product and genre). They highlighted how educators often use a single writing approach in isolation or even worse, choose the wrong approach when teaching writing. Thus, they suggested that no single approach is enough to effectively teach writing. In the context of this research, the findings contribute to the significance of incorporating CM into L2 writing as CM is a flexible method that can be applied in any writing approach (Chaka, 2010). They are versatile, multi-purpose tools in which are applicable across disciplines, and allow the transfer of CT skills (Machado & Carvalho, 2020). In addition, this adds on to the literature and suggests that CM can supplement traditional writing methods to promote CT and cognitive development and L2 learners' writing skills.

However, despite the significant progress students made in the Experimental Group (CM method), the majority did not achieve full mastery of the critical thinking skills in their writing. Mean scores for the Experimental Group was only at 19.45 out of 30 points even after CM was introduced. This suggests that while CM contributed to improvements in students' ability to organize their thoughts and enhance certain CT skills, the intervention alone was not sufficient to push students to a mastery level. CM is an effective tool that allows for a strategic mapping of ideas and designed in such a way to help students concentrate on organizing their ideas and arguments, to ensure that their thoughts are interconnected, and the writing remains cohesive and well-structured (Saputra, Setiyawan & Sumarlam, 2021). However, CT goes beyond the mapping and organisation of ideas.

Referring to the traditional Bloom's (1956) Taxonomy, higher order thinking involves skills like analysis, evaluation, and synthesis, go beyond organisation based on the recall of facts. In the present study, students might have been relying on the recall of information, surface-level facts or vague generalizations without critically examining their relevance or implications. For instance, when discussing the topic of 'Should plastic bags be banned?' students might provide supporting reasons based on their current knowledge of the topic. In other words, their conception of the supporting ideas to justify their stance might be based on direct recall of their reading or well-known facts instead of evaluating, analysing and synthesising the ideas themselves. Thus, while CM helps students identify the main points of an argument, it does not necessarily help them assess whether the supporting reasons are strong or logically sound. This phenomenon can be seen in a study by Duarte et al. (2017) where, out of 48 concept maps (648 propositions) analysed, 31% were considered as inadequate in terms of conceptual relatedness and semantic clarity, and only 27% demonstrated a high-level of proficiency in the CM method where they '*responded to the focal issue under scrutiny*'. Hence, this reveals one of the limitations in CM where, although CM fosters CT skills to some extent, it does not develop all the aspects of critical thinking, nor does it develop them fully, as this is dependent on the quality of ideas in the map. Other reasons as to the average mastery of CT skills could be attributed to the complexity of the subject matter, as the more difficult the subject matter, the more likelihood of drawing irrelevant connections and mistakes in the concept maps (Conradty & Bogner, 2008). Nevertheless, the results highlight the need for a more comprehensive approach that combines CM with additional instructional strategies aimed at enhancing higher order thinking skills and writing skills in ESL students.

5.1.2 The levels of CT skills in students' argumentative essays after CM was introduced (RQ2)

The levels of CT skills were analysed from the average score of the students' essays. Based on the findings, the highest average score was the CT skill Focus (4.35) whereas the lowest average score was in Supporting Reasons (3.7). The highest average score in Focus (4.35) suggests that students were relatively successful in maintaining clarity and relevance in their argumentative essays. This could be due to the structured approach provided by CM as it involves strategic mapping of concepts which allows a focused visualization of the ideas. According to Watson (1989), a concept map serves as a visual guide to highlight main points or key ideas that both students and teachers need to pay attention to. Furthermore, CM emphasizes the use of Focus Questions where it delineates the main problem or issue that the CM should solve (Cañas & Novak, 2006). This aligns with a study in 2024 by Supriyadi on CT skills in essays where Focus was the highest average score among the Illinois Critical Thinking Essay Rubric features. The study recorded the highest average score for the feature Focus, which is consistent with the current study. However, the lowest score in Supporting Reasons (3.7) indicates a persistent struggle in justifying their claims with well-developed arguments and evidence. Although this conflicts Supriyadi's (2024) findings where the lowest average score was Organisation (2.73), the score for Organisation is not far from that of the Reasoning (2.81) feature.

The current study's findings also demonstrate the Bloom's (1956) taxonomy cognitive domains and the workings of the Paul-Elder Critical Thinking Framework (Paul & Elder, 2010). In terms of Bloom's, the high scores in Focus demonstrate that students were able to achieve clarity and maintain relevance, which corresponds to Bloom's lower levels of *Remember*, *Understand* and *Apply* (which are easier to achieve), whereas the lower scores in *Supporting Reasons* indicate challenges and students' weaknesses at the levels of *Analyse* and

Evaluate. This is evident in Cañas & Novak's (2006) work on CM, where they highlighted how *'concept maps showing explanations require more deep or dynamic thinking'.* Similarly, Paul and Elder's Framework outlines the integration of intellectual standards, such as *clarity, relevance,* and *logic*, with cognitive traits like *intellectual courage* and *intellectual perseverance*. The findings can be explained with this framework as CM fosters clarity and relevance but does not fully address intellectual traits like *depth* and *breadth*. This gap could explain the limited development in the students' ability to reason critically and justify their arguments with evidence as seen in the low average score in Supporting Reasons. Thus, this highlights the researcher's previous point on how CM may facilitate the organisation of ideas but not necessarily in terms of critical evaluation or synthesis of ideas in writing and how supporting strategies should be added to the CM method in teaching CT.

However, although students made progress, the mastery of the CT features are only considered to be average at just below 4 (3.9). Furthermore, only one student managed to achieve a full score of 6 points under the feature 'Supporting Reasons' in the post-test. The rest of the scores averaged between 3.7 to 4.35. According to Finken (1992) in the Illinois Critical Thinking Essay Rubric, when interpreting the scores, scores given are between 1-3, it means that the feature (or the CT skill) is not evident in the work and that the writing is in its 'developing' stages, and only when they are between 4-6 that the CT skills are well-developed. This suggests that Malaysian ESL learners' CT skills are still far from the 'well-developed' stage in CT skills, and it reveals a glimpse of the status quo of CT skills among secondary schoolers in Malaysia. This finding highlights a larger issue, as the underdeveloped CT skills in Malaysian students may contribute to challenges faced by graduates in securing jobs in the future. Employers increasingly value strong critical thinking and problem-solving abilities, but many Malaysian graduates lack these skills. According to the Federation of Malaysian Manufacturers (FMM) president Soh Thian Lai, local university

graduates often show academic knowledge but fall short when it comes to soft skills such as CT skills and innovativeness (Reza, 2024). This was the situation ever since the publishing of the Malaysian Education Blueprint (2013-2025) where poor higher-order thinking skills and poor command of English were among employers' concerns in Malaysia (Ministry of Education Malaysia, 2012). Students are graduating without adequate critical thinking skills, leaving them unprepared for the workforce and contributing to less effective leadership due to limited cognitive processing abilities (Flores et al., 2010). Thus, it is imperative that secondary education expand their focus to develop CT skills to better prepare students for academic success and workplace demands in the future.

5.1.3 Implications of the findings

5.1.3.1 Integration of CM into ESL writing instruction

The data adds on to the growing body of evidence for the integration of the CM method in the writing curriculum in Malaysia. The CM method has proven itself to be dynamic, versatile, flexible, easy to use and implement in ESL classes. In addition, it does not require additional resources that the Ministry of Education has to provide for the ESL classrooms in Malaysia, which could be an advantage for rural areas that lack equity and access. CM can be used in the pre-, while and post-writing stages in Malaysian ESL writing practices, where students can benefit from the connection of ideas, organization and synthesis of information, which eventually leads to the fostering of CT skills in their writing to produce a coherent and organized piece of work. CM can be used at various stages of writing, such as prewriting to brainstorm ideas, during writing to structure arguments, and post-writing to review and refine ideas. In teaching CM in writing practices, teachers should also be aware of the maps that students produce in relation to the Focus Questions to ensure that the concept maps produced are of good quality. Therefore, teachers should consider integrating CM as a regular part of ESL writing instruction, especially for activities requiring higher-order thinking such as

argumentative writing. Instruction on how to create good concept maps should also be emphasized throughout the curriculum.

5.1.3.2 The need for further CT instruction in classrooms

The current study also provides new evidence for the state of CT skills in writing practices in Malaysian classrooms and highlights the need for remedial instruction in CT. While the study demonstrates that CM can enhance students' CT skills, when looking at the status quo of CT skills among Malaysian ESL learners, it also reveals the need for continuous and explicit CT instruction in classrooms. Thus, a new focus should be placed on CT skills in the Malaysian education with practical and applicable implementation of CT instruction. Teachers should incorporate more CT stimulating activities such as CM, argumentative writing and debates into their curriculum. They should also encourage students to ask questions and reflect on their ideas in their ESL writing practices. Therefore, integrating CT instruction throughout the curriculum, especially in writing tasks, will help students build strong critical thinking skills over time.

5.1.3.3 Additional strategies needed in the CM approach for a balanced development of CT skills

Although CM has proven beneficial in improving some aspects of critical thinking, the study suggests that additional strategies are needed to ensure a more balanced and comprehensive development of CT skills. Firstly, while CM aids in organizing information, it does not explicitly teach the components of CT, such as analyzing arguments, evaluating evidence, or identifying biases. Teachers could supplement CM with direct instruction in these areas, particularly when it comes to CT skills or features in writing. Secondly, teachers should also encourage students to reflect on their thought processes and writing strategies to help them become more aware of their cognitive processes. This metacognitive practice can improve their ability to apply critical thinking independently. Collaborative learning can also be

encouraged in the CM method to allow students to hear and challenge each other's ideas. Teachers can also tailor maps based on the proficiency of students and scaffold them in the process. Lastly, in this era of digitalisation, teachers can consider using digital tools such as online mind mapping software or interactive platforms to engage students in the mapping process for a more dynamic classroom environment.

5.1.4 Limitations of the study

5.1.4.1 Sample size

The small sample size of 40 participants, selected through purposive sampling was one of the key limitations of this study. A sample size of 40 is relatively small and may not accurately represent the broader population of Malaysian ESL learners. This small sample size cannot be a representation and cannot be generalized to the whole ESL population in Malaysia. In research, a small sample size can also increase the potential for sampling bias, where the selected participants may not fully reflect the diversity of the broader population in terms of language proficiency, learning styles, or socio-cultural backgrounds. Thus, although the findings may be insightful, they may not be applicable to other contexts or student groups without further validation through larger-scale research.

5.1.4.2 Assessment tool

Another limitation of the study is the assessment tool used to evaluate students' progress in critical thinking (CT) and writing. The rubric employed in this study to assess students' writing skills is inherently subjective. This is because it depends on the evaluator's interpretation as the marker can award points from a scale of 1-6. This subjectivity may have led to inconsistencies or variability in scores. As pointed out by Finken (1992), many essays may not perfectly match the criteria for each score. Thus, the rubric is open to interpretation,

which can affect the reliability and validity of the assessment. Additionally, due to time and resource constraints, the researcher in this study acted as the sole evaluator of the essays. This introduces the potential for bias, as individual evaluators may unintentionally prioritize certain aspects of writing over others, leading to lower inter-rater reliability. To mitigate this issue in future studies, it would be beneficial to have multiple raters. Future studies can also include objective CT assessment tools in addition to the one employed in the current study to enable a comparison and a more comprehensive view of the improvement in CT skills.

5.1.4.3 Duration of intervention

Typically, CT instruction should be conducted over a course of time to reinforce the CT skills. Critical thinking is a complex cognitive process that develops over time through repeated practice and reinforcement. Ideally, CT instruction should be conducted over a longer period so that students can engage in a variety of scaffolded activities that promote deep thinking. In the current study, the researcher is only limited to 7 weeks and 14 lessons. This limited timeframe may have been insufficient to attribute the enhancement in CT skills fully to CM. Additionally, the brief intervention period may have caused insufficient opportunities for students to internalize the CT skills.

5.1.4.4 Other factors and variables

Finally, the study did not account for a range of other factors and variables that may have influenced the outcomes. These could include students' prior knowledge, individual learning styles, motivation, and external factors such as home environment or stress levels, all of which can impact their ability to engage in and benefit from the intervention. For example, students with higher prior knowledge in environmental topics may perform better in that essay, or those who are intrinsically motivated to improve may show greater progress compared to others. Similarly, external factors such as personal challenges or a lack of sufficient support at home may impede some students' ability to fully engage with the

intervention. Moreover, the study did not control other classroom variables, such as teacher effectiveness or classroom dynamics, which could have influenced students' performance. To improve the validity of the findings, future research could address these variables by implementing a more controlled experimental design. Future studies can also explore qualitative data collection, such as interviews or surveys with students regarding the enhancement of their CT skills and its process.

5.1.5 Recommendation for future research

To solve the small sample size problem, future research expanding the sample size is necessary to ensure more representative and generalizable findings. Studies should also consider incorporating participants from different regions, educational backgrounds, and proficiency levels to examine whether the findings hold true across a broader range of learners. Additionally, random sampling methods could be employed to reduce selection bias and to ensure that the sample reflects the target population of Malaysian ESL learners more accurately. Different demographics can also be taken into account to explore how demographics correlate with CT skills.

As the current study is quantitative in nature where the focus is on the scores, it might not be able to capture the qualitative aspects of the nature of writing. In the future, studies can opt for a mixed-method approach where not only does it take into account the quantitative and objective measurements of CT skills, but it also analyses the quality of the utterances in the work. Future work may explore incorporating content and thematic analysis to examine the writing. This may even reveal how CT is manifested in the students' writing and may even offer insights into their cognitive processes in writing. Additionally, incorporating interviews with the participants would provide a valuable qualitative dimension to the study. Interviews could reveal students' thought processes and reasoning behind their writing choices. It could also offer direct insights into how they apply critical thinking strategies.

This could help explain why certain students score higher or lower on CT assessments and provide context for the writing behaviours observed in their essays.

Lastly, future research may explore the possibility of longitudinal studies on CT development. Given that developing CT skills is gradual in nature, future research can adopt a longitudinal design to track the progress of students over an extended period. This would provide valuable insights into how CT develops in response to sustained interventions. Longer-term studies would also allow researchers to examine the impact of continuous CT instruction on students' writing skills and the retention of CT abilities. Such studies could assess not only short-term improvements but also long-term effects on students' academic performance and overall cognitive development.

5.2 Conclusion

The current research aims to investigate whether the use of CM enhances CT skills in argumentative writing among Malaysian ESL students and the levels of CT in Malaysian ESL learner's argumentative writing. Quantitative methods were employed through the analysis of pre-test and post-test scores. Average scores for each CT skill in the Illinois Critical Thinking Essay Rubric was analysed. The two main research questions were as follows:

RQ1 Does the use of Concept Mapping contribute to the enhancement of CT skills in argumentative writing among Malaysian ESL students?

RQ2 What are the levels of CT skills in students' argumentative essays after CM was introduced?

Based on the findings for RQ1, it can be concluded that CM is an effective tool to enhance CT skills in argumentative writing among ESL students. The results revealed a significant improvement in the CT skills of students in the experimental group (Mean

difference = 3.15) who used CM compared to the control group that used traditional methods in teaching writing (Mean difference = 1.70). These findings align with Ausubel's meaningful learning theory and the existing literature, which supports the integration of CM into writing practices to promote cognitive engagement.

The findings for RQ2 reveal that while the introduction of CM contributed to measurable improvements in the levels of CT skills among Malaysian ESL students, these skills remain at a developing stage. The average CT scores for the 5 skills (Focus, Reasoning, Supporting Reasons, Organisation and Integration) in the students writing were only at 3.9 which is still far from a well-developed stage. The highest scores were achieved in the CT skill Focus (4.35), and the lowest scores were in Supporting Reasons (3.7). These results point to a larger concern in Malaysian education, where underdeveloped CT skills are common and may contribute to graduates' challenges in meeting workplace expectations.

This study's limitations include a small sample size, subjective assessment tools, a short intervention period, and the lack of control over external variables influencing students' performance. In the future, researchers interested in the field of CT, CM and writing can solve the sample size problem in their study and including participants from diverse demographics to ensure more representative and generalizable findings. Employing mixed-method approaches, such as combining quantitative analysis with qualitative methods like content analysis and interviews, can provide deeper insights into students' cognitive processes and how critical thinking (CT) manifests in their writing. Longitudinal studies are also recommended to track the gradual development of CT skills over time and assess the long-term impact of sustained CT instruction on students' academic performance and cognitive growth. These efforts would offer a more comprehensive understanding of CT development and improve teaching strategies for Malaysian ESL learners.

In conclusion, this research has shown that the incorporation of concept maps as a scaffold positively impacts the development of CT skills in argumentative writing among Malaysian ESL students. As argumentative writing is a part of the broader effort to develop higher-order thinking skills (HOTS) in students, this study contributes to the larger educational goal of equipping learners with critical thinking and problem-solving abilities essential for success in the 21st century through Concept Mapping. The findings not only confirm the potential of concept mapping as a pedagogical tool but also offer practical insights for improving the teaching of argumentative writing to be more effective and critical L2 writing culture in Malaysian ESL education. The findings of this study confirm the assumption that incorporating CM can effectively enhance students' CT skills in argumentative writing. This aligns with existing literature that supports the use of visual tools in promoting deeper cognitive engagement and improving writing organization (Cañas & Novak, 2006). However, it also brings forth the limitations of CM in creating a balanced development of all CT skills in writing. Thus, further research is needed to determine how they can be integrated with other instructional strategies to ensure the comprehensive development of critical thinking in ESL students.

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Appendix A

SAMPLE LESSON PLAN BASED ON CONCEPT MAPPING STRATEGY

Topic	Should plastic bags be banned to reduce environmental pollution?
Language Skill	Writing
Content Standards	4.1 Communicate intelligibly through print and digital media on familiar topics
Learning Standards	4.1.1 Explain information from (i) diagrams, (ii) charts (iii) tables (iv) graphs or other visuals
Grammar Component	Vocabulary about Environment
Lesson Objectives	This lesson aims to 1. Expose students to Concept mapping as a strategy to generate ideas. 2. Enable students to brainstorm ideas about contemporary issues in environmental conservation using Concept maps/ Mind maps.
Learning Outcomes	By the end of the lesson, the students should be able to 1. Create a Concept map with main ideas, supporting arguments and examples on the topic 'Should plastic bags be banned to reduce environmental pollution?' accurately within the time given. 2. Write a paragraph of 50 words using one main idea from the Concept map with supporting arguments and examples correctly.

Stage	Teacher Activity	Teaching Materials/Skills
Set Induction	1. Teacher tells students to look at a series of pictures. 2. Teacher asks the students what the pictures are about. 3. Teacher receives answers and gives feedback 4. Teacher summarises that the pictures are about environmental conservation	Pictures Whiteboard

	5. Teacher briefly discusses why environmental conservation is important. 6. Teacher introduces lesson topic, objectives and outcomes.	
Presentation	1. Teacher introduces Concept maps and mind maps to the students. 2. Teacher explains how concept mapping can be used to brainstorm ideas for writing. 3. Teacher provides examples of concept maps related to environmental conservation. 4. Teacher models the process of creating a simple concept map on the board.	Sample of Concept map Whiteboard
Practice	1. Teacher divides the students into small groups. 2. Teacher tells students to choose a stand (Agree or Disagree) on the topic 'Should plastic bags be banned to reduce environmental pollution?' 3. Teacher tells students to create a concept map based on their stand 4. Teacher highlights that the concept maps must include main ideas, supporting arguments and examples. 5. Teacher facilitates activity and gives feedback.	Paper Markers
Production	1. Teacher instructs students to choose one main idea from the concept maps created. 2. Teacher asks students to elaborate and write a paragraph of 50 words based on the main idea chosen. 3. Teacher facilitates activity and gives feedback.	-
Closure	1. Teacher summarises the lesson	-

Appendix B

SAMPLE LESSON PLAN FOR TRADITIONAL METHOD OF TEACHING WRITING

Topic	Should plastic bags be banned to reduce environmental pollution?
Language Skill	Writing
Content Standards	4.1 Communicate intelligibly through print and digital media on familiar topics
Learning Standards	4.1.3 Explain the main points of an idea or argument
Grammar Component	Vocabulary about the environment
Lesson Objectives	This lesson aims to 1. Enable students to analyze the pros and cons of banning plastic bags to reduce environmental pollution. 2. Enable students to develop and support their own opinion on whether plastic bags should be banned.
Learning Outcomes	By the end of the lesson, the students should be able to 1. List 3 pros and 3 cons of banning plastic bags correctly within the time given. 2. Write a paragraph of 50 words on why plastic bags should or should not be banned correctly within the time given.

Stage	Teacher Activity	Teaching Materials/Skills
Set Induction	1. Teacher tells students to look at a series of pictures. 2. Teacher asks the students what the pictures are about. 3. Teacher receives answers and gives feedback 4. Teacher summarises that the pictures are about environmental conservation	Pictures Whiteboard

	5. Teacher briefly discusses why environmental conservation is important. 6. Teacher introduces lesson topic, objectives and outcomes.	
Presentation	1. Teacher tells students about ongoing debates in environmental conservation. 2. Teacher introduces the sample topic of 'Is hunting for sport ethical, or should it be banned to protect endangered species?' 3. Teacher models on how to generate pros and cons on the whiteboard depending on the stand.	Whiteboard
Practice	1. Teacher divides the class into groups. 2. Teacher assigns the topic of 'Should plastic bags be banned to reduce environmental pollution? 3. Teacher assigns a position on the issue (for or against banning plastic bags). 4. Teacher instructs students to work together to brainstorm arguments supporting their assigned position, using evidence and reasoning.	Paper Markers
Production	1. Teacher instructs students to choose one main idea from one viewpoint of the discussion. 2. Teacher asks students to elaborate and write a paragraph of 50 words based on the main idea chosen. 3. Teacher facilitates activity and gives feedback.	-
Closure	1. Teacher summarises the lesson and dismisses the class	-

Appendix C

Illinois Critical Thinking Essay Scoring Rubric (Finken, 1992)

APPENDIX F: IGAP-LIKE SCORING SHEET FOR CRITICAL THINKING ESSAY TESTS, prepared by Marguerite Finken and Robert Ennis, Illinois Alliance for Essential Schools and Illinois Critical Thinking Project (6/1/93)

FEATURES

FOCUS	1	2	3	4	5	6
Degree to which main idea/theme or point of view is clear and maintained	Unclear; absent; insufficient length to ascertain maintenance	Confusing; attempted; main point unclear or shifts	Underpromise, overdeliver; overpromise, underdeliver; infer; two/+ positions w/o unifying statement	Bare bones; position clear; main point previewed	Position clear; generally previewed	All main points are specified and maintained
SUPPORTING REASONS	1	2	3	4	5	6
Degree to which supporting reasons and evidence are clear, believable, and from credible sources	No support; no credible sources; unbelievable vague; confusing	Attempted; dubious sources; inaccurate; vague	Some sources and/or reasons/ evidence dubious; some vagueness	Some sources credible; reasons/ evidence generally believable, sometimes second level; specific (where appropriate); clear	Most sources credible; most reasons/evidence believable, often at second level; specific (where approp); clear	All sources credible; all reasons/evidence believable, second level/beyond spec.(where approp; clear
REASONING	1	2	3	4	5	6
Degree to which conclusion supported by reasons/ evidence; alternatives addressed; and argument clear	Conclusions unsupported; no reasoning attempted; insufficient	Conclusions minimally supported; alternatives unmentioned; muddled; confused	Some insufficient support; alternatives prejudicially mentioned; key terms undefined	Moderate support; alternatives mentioned fairly; some vagueness	Conclusions well supported; alternatives well recognized; clear	Strong support; alternatives thoroughly addressed; clear
ORGANIZATION	1	2	3	4	5	6
Degree to which logical flow of ideas and explicitness of the plan are clear and connected	No plan; insufficient length to ascertain maintenance	Attempted; plan is noticeable	Not knowledgeable in paragraphing	Some cohesion and coherence from relating to topic; plan is clear	Most points connected; coherent; cohesive, using various methods	All points connected, signaled with transitions/ other cohesive devices
CONVENTIONS	1	2	3	4	5	6
Use of conventions of standard English	Many errors; unreadable, confused meaning; problems with sentence construction; insufficient length to ascertain maintenance	Many major errors; confusion	Some major errors, many minor; sentence construction below mastery	Developed; few major errors, some minor, meaning unimpaired; mastery of sentence construction	A few minor errors, but no more than one major error	No major errors; one or two minor errors
INTEGRATION	1	2	3	4	5	6
	Doesn't present most features; insuff. length	Attempts to address assignment; confusion	Partly developed; one/> features not developed	Essentials present	Features present, but not all equal	All features evident and equally well developed

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Appendix D

PRE-TEST AND POST TEST ESSAY QUESTIONS THAT WERE ADMINISTERED

Pre-test essay question

Based on the topic of ‘Should plastic bags be banned?’, write an argumentative essay of 300-350 words.

Post-test essay question

Based on the topic of “Should social media usage be limited for teenagers to protect their mental health?”, write an argumentative essay of 300-350 words.

Appendix E

Pre-test and Post-test scores of Control and Experimental Group

Control Group (n=20)			Experimental Group (n=20)		
Student	**Score (out of 36 points)**		**Student**	**Score (out of 36 points)**	
	Pre-test	**Post-test**		**Pre-test**	**Post-test**
a.	14	12	**A.**	18	24
b.	15	15	**B.**	19	25
c.	16	20	**C.**	13	13
d.	16	16	**D.**	15	19
e.	20	20	**E.**	14	14
f.	17	21	**F.**	15	17
g.	11	13	**G.**	18	24
h.	12	14	**H.**	16	20
i.	18	21	**I.**	17	17
j.	16	19	**J.**	15	20
k.	20	22	**K.**	16	17
l.	10	13	**L.**	19	22
m.	16	18	**M.**	17	17
n.	13	16	**N.**	14	17
o.	14	12	**O.**	19	24
p.	14	15	**P.**	19	23
q.	18	20	**Q.**	16	20
r.	16	17	**R.**	20	26
s.	19	22	**S.**	14	15
t.	13	16	**T.**	12	15
TOTAL	308	342	**TOTAL**	326	389
Difference	34		**Difference**	63	

Appendix F

Analysis based on CT features in Illinois Critical Thinking Essay Test Rubric before and after Concept Mapping was introduced (Experimental Group)

Features/ Student	Before Concept Mapping						After Concept Mapping					
	F	SR	R	O	I	Total	F	SR	R	O	I	Total
A.	4	3	3	4	4	18	5	4	5	5	5	24
B.	4	4	3	5	3	19	5	5	5	5	5	25
C.	3	3	2	2	3	13	3	2	3	3	3	13
D.	4	3	2	3	3	15	4	4	4	4	3	19
E.	3	3	3	3	2	14	4	2	2	3	3	14
F.	4	2	3	3	3	15	4	3	4	3	3	17
G.	4	3	3	4	4	18	5	5	5	5	4	24
H.	4	3	3	3	3	16	4	4	4	4	4	20
I.	5	3	3	3	3	17	4	3	3	4	3	17
J.	4	2	2	4	3	15	5	3	4	4	4	20
K.	4	3	3	3	3	16	4	3	4	3	3	17
L.	5	4	3	4	3	19	5	4	4	4	5	22
M.	4	3	3	4	3	17	4	3	3	4	3	17
N.	3	2	3	3	3	14	4	3	3	4	3	17
O.	4	3	4	4	4	19	5	5	4	5	5	24
P.	5	4	3	4	3	19	5	5	5	4	4	23
Q.	4	3	3	3	3	16	5	4	4	3	4	20
R.	5	4	3	5	3	20	5	6	5	5	5	26
S.	4	2	2	3	3	14	3	3	3	3	3	15
T.	4	2	2	2	2	12	4	3	2	3	3	15
AVERAGE	4.05	2.95	2.8	3.45	3.05	16.3	4.35	3.7	3.8	3.9	3.75	19.45