A Study of the Use of Computational Concept Mapping Situated in an Authentic Learning Context (CCMAL) in Enhancing English as a Foreign Language (EFL) Students' Metacognition in Reading Comprehension Classes

Thi Huong Le

Thesis submitted in fulfilment of the requirements

of the degree of Doctor of Philosophy

WESTERN SYDNEY
UNIVERSITY

August 2021

Dedication

This study is wholeheartedly dedicated to my sons - Manh Tan Le and Ryan Khang Le,

who have been my source of inspiration and motivation to complete my PhD journey.

Thank you for giving me strength when I thought of giving up.

Statement of Authentication

To the best of my knowledge and beliefs, the work presented in this thesis does not contain any material that has been submitted, in full or in part, for a degree at this or any other institutions. I hereby declare that the intellectual content of this thesis is my own work.

Thi Huong Le

August 2021

Acknowledgement

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Abbreviations

CCM	Computational concept mapping
CCMAL	Computational Concept Mapping Situated in Authentic Learning Context
CEFR	Common Europe Framework of Reference
CG	Control Group
CLT	Communicative Language Teaching
CM	Concept maps
CM1	Concept maps collected in week 1
CM2	Concept maps collected in week 4
CM3	Concept maps collected in week 7
DETQ	Department of Examining and Training Quality
EFL	English as a Foreign Language
EG	Experimental Group
ESP	English for Special Purposes
ESU	Eastern Star University
GSE	General Self-Efficacy
ICF	Informed Consent Form
ICT	Information and Communication Technology
IHMC	Florida Institute for Human and Machine Cognition

IT   Information Technology

L2   Second Language

MOET   Ministry of Education and Training

MRCM   Metacognitive Reading Comprehension Strategies Model

NFLF   National Foreign Language Framework

PBL   Project Based Learning

PIS   Participant Information Sheet

SIB   Student Information Board

SIRCA   Strategic Iterative Reading Comprehension Approach

UMCMA   Rubrics for Assessing Concept maps - University of Minnesota Digital Media

                Center

WSU   Western Sydney University

WTO   World Trade Organisation

Abstract

This thesis described a convergent mixed method research which aims to investigate the influence of computational concept mapping situated in an authentic learning context (CCMAL) on students' metacognition in English as a foreign language (EFL) reading comprehension classes. A hundred first year English non-majored students were invited for this study. The students participated a two-hour session on a weekly basis during a seven-week reading course. While the fifty students of the experimental group (EG) were exposed to CCMAL, the fifty students of the control group (CG) were exposed to a traditional teaching environment during the reading course. Data was collected through the pre and post-test on reading comprehension, pre and post-survey on metacognition, students' computational concept maps collected in week 1, week 4 and week 7 of the reading course, weekly learning journals and classroom observation, and individual interviews after the reading course.

The study found that the students of the EG outperformed those of the CG in the post-test on reading comprehension. In terms of reading comprehension skills, data showed that CCMAL had positive influence on the students' use of literal skills, interpretive and inferential skills. The study also found that CCMAL had a positive influence on the students' metacognition. Specifically, CCMAL was found to have the greatest influence on students' scores on monitoring followed by evaluation. However, there were no significant differences on the students' scores on planning. The utilisation of CCMAL positively influence students' use of metacognitive strategies, such as planning, monitoring and evaluation.

Furthermore, the study discovered that the students' CCMAL learning experience was influenced by factors as the relevance between the reading text topics and the students'

experiences, the students' individual differences, and the affordances of Cmap which was the concept mapping software in this study.

In conclusion, this study found that the use of CCMAL had positive influence on students' metacognition and reading comprehension. It is recommended that CCMAL be widely used in reading comprehension classes to enhance students' reading achievements. Moreover, it recommended further research into concept mapping related topics for improving the quality of English education in Vietnamese context.

CHAPTER 1: BACKGROUND TO THE STUDY

1.1 Introduction

Given the rising importance of English as a global language, it is not surprising that English has gained significant role in the educational system in Vietnam. Hence, this thesis shall begin with a background introduction to the teaching and learning of English as foreign language (EFL) in Vietnam. To contextualise the research, it then presents a comprehensive introduction to the National Foreign Language 2020 Project (NFL 2020 Project), student-centred language teaching methods in Vietnam, and the need to enhance EFL students' reading comprehension in that country. Section 1.2 outlines the research problems specifically pertaining to reading comprehension in the Vietnamese context. Section 1.3 presents the aims and research questions of the study, and Section 1.4 describes the research intervention conducted. Section 1.5 concludes the chapter.

1.1.1 Teaching and learning English as a foreign language (EFL) in Vietnam

The widespread influence of English as a global language has impacted the Vietnamese people economically, culturally, and educationally. The historical development of modern Vietnam has contributed to the increasing status of English in that country. Of note is the Vietnamese government's orientation towards a freer market economy, beginning with the open-door policy initiated by the Vietnamese Communist Party at its 6th National Congress in 1986 to help create a socialist-oriented market economy in the world (Canh, 2001, p. 46; 2007). Another reason for the increasing importance of English in Vietnam was the country's entry into the World Trade Organisation (WTO) in 2006 and the subsequent trend towards globalisation and sustainable development (Canh & Barnard, 2009). A growing number of areas in Vietnamese society, such as tourism, finance, technology and business, require high abilities in English for communicating, exchanging information, and improving knowledge.

To more effectively meet the demand for the human resources needed to sustain national development in Vietnam, a range of national policies to expand the scope of English language education and to improve its quality have impacted educational reforms (Thuy, 2019). In the Vietnamese education system, EFL is a compulsory subject for students after years 1 and 2 of primary school (Ministry of Education and Training (MOET) Circular 32/2018/TT-BGDĐT, 2018). At the tertiary level, English is taught as an elective subject alongside Chinese, French and Russian (Ngoc et al., 2018). Unlike these other foreign languages, however, the MOET places a premium on EFL because it aims to "make foreign language an advantage for Vietnamese people, serving the cause of industrialisation and modernisation of the country" (MOET, 2008, p. 46). The MOET provides the general timeframe for teaching English in all institutions, but each institution chooses its own teaching materials and pedagogies and develops its own teaching and assessment guidelines. At university, students can register for English-majored courses to obtain bachelor's or master's degrees.

There are different views on which of two registers of English should be taught at the tertiary level: the Academic Register (AR) and/or the General Register (GR) (Van, 2010). Advocates for the AR hold that students in specialised majors should be taught the terminologies for professional development. In contrast, advocates for the GR hold that students should study English for communication and general purposes, and that once they understand the GR, they will be able to develop their AR by themselves. In both registers, students have to learn the phonological system of English and how to use appropriate grammatical structures in a range of contexts. In addition to lexicogrammar, students are taught macro-language skills (listening, reading, speaking, and writing) and vocabulary. Most Vietnamese universities support an integrative GR–AR view in EFL classes (Van, 2010). That is, students attend

general English classes before attending English for special purposes (ESP) classes in relation to their majors.

Teaching EFL in Vietnam is characterised by teacher-centred methods that have been traditionally popular with most educators and curriculum designers (Canh, 2007; Hong et al., 2014; Son, 2011). The teacher-centred approach assumes that teachers are the knowledge providers, and the students passively receive information from them. It overlooks the role of students in the teaching process by ignoring their potential, creativity, initiative and emotions. Criticisms of teacher-centred approaches include that students become bored and discouraged when they cannot actively participate in the learning process or express their ideas (Liu & Long, 2014; Son, 2011; Van et al., 2017).

The need for pedagogical reform is increasingly being acknowledged because the traditional emphasis on accuracy in writing rather than the acquisition of the spoken language is no longer appropriate for many Vietnamese today (Yen, 2019). EFL education in Vietnam is moving towards student-centred approaches to promote students' autonomy and improve their learning (Son, 2011; Tam, 2018). Consistent with this vision, this thesis aims to contribute to the expanding repertoire of student-centred EFL teaching and learning, specifically at the tertiary level.

1.1.2 The National Foreign Language 2020 Project (NFL 2020 Project)

As just mentioned, the teacher-centred approach emphasises the teacher as the knowledge provider and, by ignoring the students' active role in the learning process, it fails to promote students' initiative and creativity and thus negatively influences their communicative competence (Son, 2011). In response to this concern, the National Foreign Language Project 2020 (NFL 2020 Project) aims to improve the quality of foreign language teaching and increase students' autonomy in language learning by promoting more student-centred

teaching (Loi & Hang, 2014; Thuong, 2017). It represents the government's attempt to comprehensively reform foreign language teaching and learning in the national education system.

The NFL 2020 Project reforms include teacher education; teaching and learning facilities; and teaching materials, assessment, and methods. They aim to enhance EFL teachers' pedagogy, particularly for students with low second language (L2) ability (Thuong, 2017). The objective of Project 2020 is "by the year 2020, most Vietnamese youth who graduate from vocational schools, colleges and universities gain the capacity to use a foreign language independently" (MOET, 2008, p. 46). Using language independently means that to graduate from universities, students should attain Level 3 of the six-level National Foreign Language Framework (NFLF), which is used to assess foreign language proficiency in Vietnam. The six levels of the NFLF resonate with the six levels of the Common European Framework (CEFR) (MOET, 2014) (Table 1.1). This should enable them to communicate more confidently and further their chances of studying and working in integrated and multi-cultural environments with a variety of languages. This objective makes "foreign languages an advantage for Vietnamese people, serving the cause of industrialisation and modernisation of the country" (MOET, 2008, p. 46).

Table 1. 1: The Compatible Levels of the NFLF and the CEFR

NFLF		CEFR
Elementary	Level 1	A1
	Level 2	A2
Intermediate	Level 3	B1
	Level 4	B2
Advanced	Level 5	C1
	Level 6	C2

1.1.3 Student-centred language teaching methods in Vietnam

Educators in EFL in Vietnam have previously attempted to introduce more student-centred approaches to teaching and learning (Son, 2011). The most prominent feature of student-centred approaches is the students' active involvement in the teaching-learning process as they construct knowledge through gathering and synthesising information and integrating it with the general skills of inquiry, communication, critical thinking and problem-solving (Son, 2011). The role of the teacher is that of a knowledge facilitator rather a knowledge provider. In the context of language education, communicative language teaching (CLT), which focuses on interaction and communication in classrooms, has been advocated as an effective and practical teaching approach to promote student-centredness (Richards, 2006; Son, 2011). In the context of teaching English in Vietnam, Anh (2010) has argued that the merits of CLT lie in its potential for promoting students' communicative competence through the acquisition of language knowledge and use of the language.

A number of empirical studies have shown the positive influence of CLT on students' academic achievements (Khoi, 2014; Mai, 2017; Minh, 2016). According to Khoi (2014), CLT can greatly enhance students' interest by encouraging them to participate in classroom activities that are sometimes accompanied by real-life or simulated scenarios that embed students in authentic learning contexts. Moreover, because CLT focuses on developing students' communicative competence through interactions, it can enhance teacher-student relationships and collaboration in the classroom (Mai, 2017). Despite these benefits, the implementation of student-centred methods like CLT in EFL teaching in Vietnam has presented some challenges, namely, students' low English proficiency level and their lack of motivation for communication (Bock, 2000). These factors have been compounded by teachers' lack of CLT training and the large class sizes in Vietnam (Son, 2011).

Project-based learning (PBL) is another promising approach to student-centred learning that Vietnamese EFL students have demonstrated positive attitudes towards (Felipe et al., 2016). In PBL students actively construct their learning by formulating and addressing their own questions. They work collaboratively as a team on a project, and the teachers become facilitators who guide their learning using real-world problems and challenges. Duc (2009) gathered data related to PBL classes conducted in nine different colleges in Vietnam and found that both students and teachers effectively adopted a PBL approach to learning and teaching EFL.

Along with CLT and PBL, information and communication technology (ICT) use is also on the rise in EFL classes in Vietnam for the same purpose of increasing student autonomy and language competency (Lan, 2019; Long, 2016; Nhon, 2011; Nhu et al., 2018). ICT can be categorised into two types: 1) generic software applications such as word processors or presentation software; and 2) specific software applications and websites that focus on purposeful language teaching and learning (Long, 2016). Lan (2019) used ICT as the platform to foster collaborative learning in EFL writing classes. Nhon (2011) recommended digital tools (e.g., Hot Potato, QuizStar) and dedicated websites (e.g., The Grammar Aquarium, Compleat Lexical Tutor) that deliver online grammar and vocabulary lessons. Other researchers have introduced concept mapping in reading comprehension classes in the Vietnamese context (Hien & Phuong, 2018; Huan & Quan, 2018; Trang, 2017). Huan and Quan (2018) found that concept mapping had a positive influence on EFL students' ability to summarise reading passages, and Trang (2017) recommended it as a metacognitive tool for improving students' reading comprehension. Nevertheless, little is known about the use of concept mapping situated in an authentic learning context in reading comprehension.

Reading is considered a viable means of developing L2 ability (Gorsuch & Taguchi, 2010), and sound comprehension is critical to language learning success (Foncha, 2014; Yoğurtçu, 2013). However, the literature by Vietnamese educators on reading comprehension for non-English major students is particularly limited (Hien & Phuong, 2018). To contribute to this gap, this researcher was keen to implement a student-centred learning-teaching method with EFL college students with the aim of enhancing their reading comprehension skills, specifically through the use of technology.

1.1.4 Enhancing EFL students' reading comprehension in Vietnam

Reading comprehension is a complex and multidimensional activity, with different views of it represented in the wider literature (Kendeou et al., 2016). Researchers interested in metacognition focus on the cognitive process and consider reading comprehension the construction of a coherent mental representation of the text in the readers' memory. This mental representation includes the decoded textual information and associated background knowledge (Kendeou et al., 2014). This study considers reading comprehension from a cognitive perspective and recognises the role of students' prior knowledge and experience.

The NFL 2020 Project states that Vietnamese university graduates of non-English majors need to achieve level 3 of the NFL framework in all macro skills. In reading comprehension, students who achieve this level "can read relatively independently, can adjust reading style and reading speed for each type of text and reading purpose, as well as use suitable reference sources selectively" (MOET, 2014, p. 14). In particular, the NFL 2020 project expects that after graduating from universities, students are able to skim texts for their main ideas and scan them for specific information, summarise texts of different types, synthesise information from texts, make inferences, and guess new words in texts of different topics.

Research shows that Vietnamese students struggle in English reading comprehension (Chung, 2012; Thao & Tham, 2018; Trang & Anh, 2017; Van et al., 2017). They were found to encounter difficulties when they read texts with unfamiliar topics (Thao & Tham, 2018) and to mainly decode texts by consulting the dictionary for every new word due to their insufficient background knowledge of the text topics (Chung, 2012). Insufficient awareness of reading strategies can lead to insufficient comprehension (Trang & Anh, 2017), and lack of authentic interactions can reduce communicative competence (Hoang, 2013). In contrast, authentic reading materials can facilitate reading comprehension when they contain information students can relate to their daily life experiences (Islam & Santoso, 2018) and by motivating students to engage in communicative activities (Bock, 2000).

1.2 Research problems

This research was undertaken at the start of NFL 2020 Project. It emerged from the increased need in Vietnam to enhance the quality of student-centred English language teaching methods (Hoang, 2013; Van, 2010). Most Vietnamese EFL teachers who were taught in traditional ways tend to use teacher-centred methods because their backgrounds continue to have a profound influence on their current teaching methods (Hong et al., 2014). Given this shift towards student-centred approaches, research is needed to understand students' learning processes and how best they learn EFL.

In the context of implementing the NFL Project 2020, research on enhancing students' reading comprehension is also under-represented. As stated in its guidelines, The NFL Project 2020 advocates for communicative competence to be developed:

> Most Vietnamese youth who graduate from vocational schools, colleges and
> universities gain the capacity to use a foreign language independently. This will
> enable them to be more confident in communication, further their chance to study and

work in an integrated and multi-cultural environment with a variety of languages.

(MOET, 2008, p. 46)

Communicative competence can be understood as the ability to use language appropriately to communicate in authentic social and school environments (Canale & Swain, 1980). It comprises the tacit knowledge of language (linguistic competence and sociolinguistic competence) and the ability to use language effectively (discourse competence and strategic competence). This study used a student-centred learning method for developing students' discourse competence through enhancing their reading comprehension skills. It also used authentic learning to boost students' communicative competence by providing them with real-world situations to develop their communication skills.

Researchers have identified the lack of active instruction as one of the major reasons for inadequate results of reading comprehension in Vietnamese schools (Hung & Thao, 2014; Thao & Lap, 2011). Active instruction is believed to be essential to engage students in the learning process. It provides students an opportunity to think and engage with course material and articulate their thinking. Moreover, students can practise skills for learning, applying, synthesising and summarising the course material (Auerbach et al., 2018). There have been attempts to investigate the elements of reading comprehension among Vietnamese students, such as motivation (Thao & Son, 2018; Thuy, 2018), students' background knowledge (Phuc, 2020; Thao & Son, 2018; Trang, 2012), and students' reading strategies (Phuc, 2020; Thu et al., 2019). Although metacognition is claimed to be among the most important factors that enhance students' reading comprehension ability, there is a lack of detailed investigation on the relationship between students' metacognition and their reading comprehension in Vietnamese colleges.

Concept mapping has been found to enhance students' EFL reading comprehension (Khaghaninejad & Arefinejad, 2015; Liu et al., 2010) and metacognition (Cassata & French, 2006; Chevron, 2014; Novak & Canas, 2008). Concept mapping is the technique for constructing a concept map, which is a node–link diagram showing the semantic relationships among concepts (Schwendimann, 2014). In the digital age, computational concept mapping has been widely used for EFL teaching. According to Liu et al. (2010), computational concept mapping refers to the process of constructing concept maps based on the digital platforms via computer software. Computational concept mapping is believed to facilitate students' concept map revision because students can keep asking questions about the problem, such as which concept is suitable to the node, and what is the relationship between the concepts (Liu et al., 2010). In this way, computational concept mapping helps students become deliberately aware of what they know, how to proceed, and what can be done to solve a problem (Asiksoy, 2019; Bruillard & Baron, 2000). In addition, authentic learning has been referred to as an effective learning approach that helps language learners improve their language skills (Lombardi, 2007). Coupled with authentic learning, this study recommends computational concept mapping situated in authentic learning contexts (CCMAL) to enhance EFL students' metacognition in their reading comprehension classes.

The potential benefits of CCMAL have yet to be harnessed for EFL teaching. Based on an extensive review of the current related research, very few studies have discussed the use of CCMAL in the context of EFL teaching. It may be useful as an alternative to traditional teaching for equipping Vietnamese college students in attaining English proficiency in accordance to level 3 of the NFL framework. Accordingly, this research study has examined the influence of CCMAL on Vietnamese college students' EFL reading comprehension.

1.3 Research aims and research questions

This research study had the following four objectives:

1. To design an intervention through the use of CCMAL to engage students in a student-centred approach to learning EFL.

2. To investigate the influence of CCMAL on students' reading performance and the development of their reading comprehension skills.

3. To examine the influence of CCMAL on EFL learners' metacognition and their use of metacognitive strategies.

4. To identify emerging factors that may influence students' CCMAL learning experience in EFL reading classes.

In line with these objectives, this study addressed the following three research questions:

1. How does CCMAL influence EFL learners' reading comprehension?

2. How does CCMAL influence EFL learners' metacognition?

3. What are the emerging factors that influence EFL learners' CCMAL learning experience?

In response to the above research questions, this study aims to examine the following hypotheses:

1. Hypothesis 1: CCMAL has a positive influence on students' scores on reading comprehension.

2. Hypothesis 2: Students of the EG perform better in reading comprehension than those of the CG.

3. Hypothesis 3: There is a positive correlation between the use of CCMAL and students' metacognition.

This study focuses on examining how CCMAL influences students' reading comprehension achievement and their utilisation of reading comprehension skills. Accordingly, specific definitions of reading comprehension skills and types of reading comprehension skills are discussed in detail in Chapter 2.

1.4 Computational concept mapping situated in an authentic learning context (CCMAL) as an intervention

Answering the above research questions involved an intervention using the computational concept mapping tool Cmap (Novak & Canas, 2007, 2008) with Vietnamese first-year non-English major university students. Unlike paper-based concept mapping, Cmap requires students to manipulatee concept map construction on computers, which allows them to add a large number of concepts to the maps and to correct them more quickly and easily (Liu et al., 2010).

During the intervention, the participating students were provided on a weekly basis with a reading text about a specific topic. To implement CCMAL, the researcher drew on the notion of authenticity, which emphasises the relevance of the reading text to the students' real-life experiences. Hence, in this study, authentic learning contexts refer to text topics that are familiar to students' everyday knowledge and experience (Lombardi, 2007). The next sub-section describes in more detail the intervention anchoring this research.

1.4.1 Concept mapping

Concept mapping is a graphical tool for representing and organising knowledge (Novak, 2004; Novak & Canas, 2008). Schwendimann (2014) defined a concept map as a node–link diagram showing the semantic relationships among concepts. In a concept map, concepts are connected by propositions that indicate how these concepts are semantically related. Hence, concept maps are effective for representing concepts and their propositional relationships.

A concept map includes two main components: the concepts, which are usually enclosed in the nodes, and the relationships between concepts, which are indicated by a line connecting two concepts. In this study, a concept is defined as "a perceived regularity in events, objects, or records of events or objects, designated by a label" (Novak & Canas, 2008, p. 1). Most concepts are labelled in words, or in some cases, symbols (e.g., +, %, $).

According to Novak and Canas (2007), the links are presented in the form of lines or arrows that connect two concepts to make meaningful statements called propositions. The relationship between two concepts can be uni- or bi-directional. Propositions indicating uni-directional relationships are in the formula [A —x—> B], where A and B are the two concepts of the proposition and x is the relationship between A and B. The one-way relationship between two concepts of the propositions is indicated by an arrow. In the case of the bi-directional relationship between two concepts, the formula of the proposition is [A —x – B]. The bi-directional propositions, where two concepts have a mutual relationship, are indicated by lines.

In this study, concept mapping was conducted as a project-based activity, in which the students were asked to construct a concept map based on their understanding of a reading text. The concept mapping procedure developed by Pannen (2001) was used. The process began with the teacher posing a focus question that required the students to identify the topic of the text. The teacher then asked them to read the text and determine the key concepts. After finding the key concepts, the students connected and related them to the main idea and then ranked them; the most general concept would come first, followed by the links to smaller, more specific concepts. The students were then asked to identify the relations between the concepts found in the second step and arrange these concepts and their relationships on the map. They were also encouraged to expand their concept maps by

including concepts that had not been in the reading text to help them understand the key concepts and deepen their knowledge.

1.4.2 Cmap

Developed by the Florida Institute for Human and Machine Cognition (IHMC) (Novak & Canas, 2008), the Cmap software is designed for constructing two-dimensional concept maps. It has two modes of map construction: the standard default mode and the advanced mode. The default mode provides students with a specific concept map format in which the nodes are rectangles and the text format of the concepts is Arial, size 10. The advanced mode provides format options for nodes, links, texts and map patterns, as well as the ability to add photos or videos to the nodes to illustrate the concepts. Figure 1.1 shows an example of a concept map that describes the structures of concept maps and illustrate the above advanced characteristics.

Figure 1. 1: *An Example of a Concept Map* (Thu Mai, Week 4)
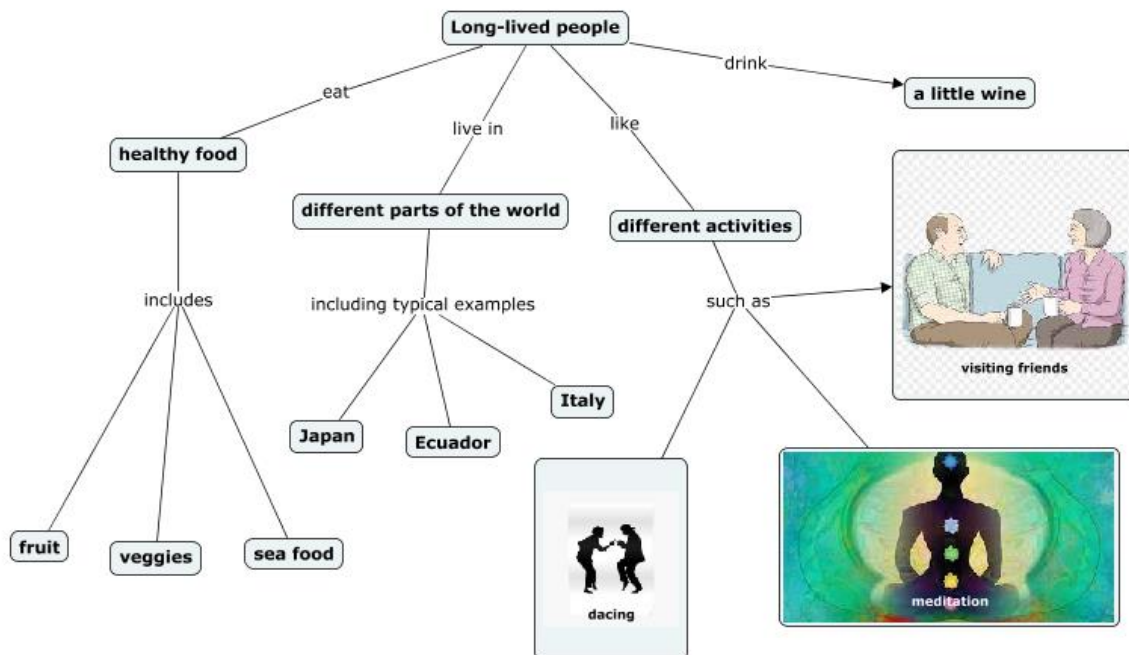
1.4.3 Authentic learning contexts

In this study, authentic learning was facilitated by the teacher connecting the students' real-world general knowledge to relevant reading topics (Lombardi, 2007). The researcher selected seven texts from the book *English File* (Latham-Koenig et al., 2012), which is currently used as the official English 1 textbook for English non-major classes at the site university. Under normal circumstances, the Vietnamese Department of Examining and Training Quality, not the teachers or tutors, would choose the textbooks for reading comprehension. The topics of the seven reading texts were "Family", "English", "Music", "Long-lived people", "Haunted houses", "Traveling" and "Food". These were selected because their topics are familiar to students' daily lives. They included both descriptive and informative texts, and each was approximately 250 to 300 words long. The reading topics and their genres are presented in Table 1.2.

Table 1. 2: Text Topics and Types of Texts

Week	Topic	Types of texts
1	Family	Descriptive
2	English	Informative
3	Music	Informative
4	Long-lived people	Informative
5	Haunted houses	Descriptive
6	Travelling	Descriptive
7	Food	Informative

Figure 1.2 is a sample text from Latham-Koenig et al. (2012). It is about the haunted houses and it was provided to students in week 5 of the reading course. The rest of the selected reading texts are presented in Appendix 16.

Figure 1. 2: *Reading Text about Ghosts* (From Latham-Koenig et al., 2012, p. 64)

ENGLAND GOSFORTH HALL INN

Gosforth Hall is a small hotel in Cumbria in the north of England, built in 1658. People say the hotel has the ghost of a Catholic priest. He usually appears in Room 11. There is a secret tunnel that goes from behind the fireplace in the hotel lounge to Room 11. In 17th-century England, Catholic priests used the tunnel to hide from Protestants.

The owner of the hotel, Rod Davies, says: 'I didn't believe in ghosts before I came here, but strange things happen in the hotel. One guest woke up in the middle of the night and saw a tall man standing next to his bed. He checked out the next morning.' Rod's wife says: 'One night a lot of books fell off a shelf in the lounge. And sometimes when I am working I feel that someone is watching me, but when I turn round nobody is there.'

GHOST HUNTERS: Ask for Room 11   www.gosforthhallhotel.co.uk

SCOTLAND COMLONGON CASTLE

Comlongon is a 15th-century castle in a small village near Dumfries in south-west Scotland. The castle is haunted by the Green Lady, the ghost of Lady Marion Carruthers. Lady Marion was unhappy because she was married to a man she did not love, and in 1570 she jumped from the castle walls and killed herself. Many strange things happen in the hotel – doors open and close, and lights go on and off in empty rooms. An American couple once opened the door of their room and saw a young woman sitting on the bed. They left because they thought they were in the wrong room. In fact it was their room, but when they came back the room was empty.

GHOST HUNTERS: Ask for The Carruthers suite.   www.comlongon.com

1.5 The outline of the thesis

This thesis is organised into seven chapters. This chapter has introduced the study, established the research background, the study's aims and the research questions. Chapter 2 reviews the literature concerning CCMAL, metacognition and reading comprehension.

Chapter 3, the methodology chapter, describes the concurrent mixed-method research design that combined quantitative and qualitative methods. It presents the theoretical orientation underpinning the study and the types of data collection and analysis adopted. There are also sections on the ethical considerations associated with data collection and on establishing the reliability and validity of the study.

In Chapters 4, 5 and 6, the analyses of both qualitative and quantitative data are presented and discussed in relation to research questions 1, 2 and 3, respectively. Chapter 4 discusses the influence of CCMAL on the participating students' reading comprehension scores and skills. Chapter 5 presents the influence of CCMAL on the students' metacognition and metacognitive strategies for reading comprehension. Chapter 6 presents the factors that influenced the students' CCMAL learning experiences.

Chapter 7 concludes the thesis. It summarises the research and discusses its significance. It also makes recommendations for curriculum designers and policymakers about the implementation of CCMAL in EFL teaching and learning, both generally and specifically in the Vietnamese context. Finally, the chapter considers the study's limitations and briefly presents the researcher's reflections on her experiences during this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

As mentioned in chapter 1, this study aims to identify the influence of CCMAL on ELF students' reading comprehension and metacognition. To achieve this aim, three research questions are set out: 1, How does CCMAL influence EFL learners' reading comprehension? 2, How does CCMAL influence EFL learners' metacognition? 3, What are the emerging factors that influence EFL learners' CCMAL learning experience? (Refer to section 1.3). The purpose of this chapter is to provide a general overview of the components of CCMAL in relation to reading comprehension and metacognition.

This chapter begins with a review of the constructs embedded in computational concept mapping in an authentic learning context (CCMAL) and discusses the relationships between these constructs and reading comprehension in the context of EFL teaching. Section 2.3 discusses how in this study; the development of reading comprehension was anchored in the cognitive perspective. Section 2.4 is a review of metacognition in reading comprehension, and Section 2.5 concludes the chapter.

2.2 Computational concept mapping situated in an authentic learning context (CCMAL) and reading comprehension

As discussed in chapter 1, Novak and Canas (2008) introduced two types of concept mapping techniques: "fill-in-the-map" and "construct-the-map". For a fill-in-the-map activity, students are provided with a concept map where some parts of the concept (e.g., the concepts or the linking words) have been left out, and they complete the missing parts of the map. In the construct-a-map technique, students construct their concept maps by themselves. Novak and Canas (2008) claimed that fill-in-the-map activities help to reduce novice mappers' cognitive load by providing them with scaffoldings, while construct-the-map activities are more

effective for expert mappers. Soleimani and Nabizadeh (2012) found that construct-the-map activities had a more positive influence on students' learning autonomy than fill-in-the-map activities. The influence of each activity type on students' learning might depend on the particular students who received the instructions or on contextual factors such as their preferences for and prior experiences of concept mapping (Novak, 2004).

Educators have suggested several concept map construction procedures in the context of a reading comprehension class (Pannen, 2001; Tabatabaei & Khalili, 2014). Pannen (2001) suggested a three-step concept map procedure:

> First, the concept mapping starts with the main idea, topic, or issue to focus on. Novak and Canas (2007) recommended using a focus question – something that needs to be solved or a conclusion that needs to be reached – as an effective way to identify the text's main ideas. Once the topic of the concept map is decided on, this will help with the concept map's hierarchical structure.

> Second, students determine the key concepts. In this step, students find the key concepts that connect and relate to the main idea and rank them; the most general concept comes first, then the links to smaller, more specific concepts.

> The last step is completing the concept map. Once the students have connected the concepts by phrases or words, the concepts are created, and crossing links, which connect concepts in different areas of the map, are added to further illustrate the relationships and strengthen students' understanding of the topic.

Likewise, Tabatabaei and Khalili (2014) proposed a four-step concept map construction procedure: brainstorming, selecting concepts, arranging concepts, and identifying the relationships between concepts. In the first step, students are asked to think about the topic

and then express what comes to their minds, without caring about its appropriateness or relevance. In the second step, they determine the relevant concepts in the text. In step 3, they determine the more exclusive concepts relative to the less exclusive ones and then arrange these in a hierarchical order with the most exclusive term on top. The final step is determining the relationship between the concepts: students determine the relationships between concepts by drawing lines between the concepts. Interrelationships are also identified in this step.

Generally speaking, Tabatabaei and Khalili's (2014) concept map construction procedures are quite similar to Pannen's (2001) in that the completion of a concept map involves identifying the relationship between concepts and arranging the concepts on the map. In this study, Pannen's (2001) model was used because it includes three main activities of concept mapping: identifying the topic of the concept map, identifying the concepts for the concept map, and identifying the relationships between the concepts.

Concept mapping can facilitate students' text comprehension in the different phases of reading comprehension. It can be used as a planning activity in the before-reading phase (Tabatabaei & Khalili, 2014; Tajeddin & Tabatabaei, 2016), a monitoring strategy during reading (Phantharakphong & Pothitha, 2014; Usman et al., 2017; Yousofi & Seidi, 2015) and an evaluation strategy after reading (Khodadady & Ghanizadeh, 2011; Trang, 2017).

Regarding Vietnamese higher education context, there have been efforts to utilise concept mapping in reading comprehension classes. Huan and Quan (2018) found that using concept maps helped to enhance students' ability to summarise the reading text. Similarly, Trang (2017) asserted that concept mapping used as a metacognitive tool could foster students' reading achievements as well as positively influence students' learning attitudes.

By building on students' prior knowledge and asking them to reflect on their understanding while reading, concept maps have been shown to help struggling readers (Kraayenoord, 2010). According to the Australian National Education Association (no date), concept maps allow students to discuss and reflect on how they each interpreted the concepts and words' connections of the subject matter. Pishghadam and Ghanizadeh (2011) have suggested that using concept mapping for reading comprehension might be resisted by students who have already developed solid skills for factual memorisation and that students might be intimidated by using concept maps for reading comprehension because the maps require seeing relationships between concepts, ideas, theories, questions, etc. However, for Bruillard and Baron (2000), from a constructivist perspective, challenging students with required tasks can create the conditions for effective learning; it is the students' responsibility to overcome the difficulties of the task and to flexibly adapt to different learning approaches. Although Novak (2004) and Novak and Canas (2007) have affirmed the effectiveness of concept mapping for learning, certain important issues from previous studies are yet to be resolved.

The issue about concept mapping according to Oliver (2009) is that it can be overwhelming to both teachers and students, and that it limits users to keywords which had led to a vague understanding of the lessons. Bruillard and Baron (2000) pointed out two major problems that students might experience during concept mapping: disorientation and cognitive overload. Since concept mapping requires students to make decisions for their concept maps by themselves, they might "get lost" or disoriented during map construction if they receive insufficient instruction. They might also experience cognitive overload while concept mapping if they receive inadequate scaffolding. Entrusting readers with the responsibility to choose pertinent paths for finding information and constructing meaning can place more demands on them and cause cognitive overload. Bruillard and Baron's (2000) findings have been supported by other researchers (Asiksoy, 2019; Chang et al., 2001). Chang et al. (2001)

found that novice students tended to be frustrated in the concept map construction process as they were disoriented and overwhelmed at times. These issues of concept mapping are discussed in more depth in Section 2.2.2.

2.2.1 Theorising concept mapping

In this study, it is assumed that concept mapping is driven by three main theories; they are Assimilation theory, Constructivism and Dual Coding theory.

The first theoretical principle of concept mapping is derived from Ausubel's (2000) assimilation theory, the fundamental idea of which is that learning occurs through the assimilation of new knowledge based on what students already know. Students' learning and retention of new information can be facilitated if they have an obvious and categorised cognitive structure (Novak & Canas, 2007). Ausubel's theory of learning provides the conceptual or theoretical foundation for concept mapping, which states that meaningful learning is dependent on integrating new information into a cognitive structure established during previous learning (Safdar et al., 2012). Safdar et al. (2012) stated that the works of Novak and Gowin (1984) created a theory of instruction based on Ausubel's meaningful learning principles, which uses concept maps to represent meaningful relationships between concepts and prepositions. A cognitive map, according to them, is a kind of visual road map that shows some of the paths we can take to connect the meanings of concepts (Safdar et al., 2012). Hence, new concepts can be assimilated into students' existing concepts through concept mapping.

In Ausubel's (2000) theory, ideas are connected in a hierarchical order, with the more specific concepts subsumed under the more inclusive and general ones; subsumption allows students to absorb new information into their cognitive structures. Ausubel's theory is divided

into three stages: the presentation of an advance organizer, the presentation of a learning task or material, and the strengthening of the cognitive organization (Hoffman et al., 2021). According to Hoffman et al. (2021), this demonstrated meaningful learning by organizing new information about old knowledge. Concept maps represent a hierarchical structure of information within a concept and show how all information can be organized and related (Bailey & Rutledge, 2017). In terms of learning mode, Mayer (2002) distinguished between two aspects of learning: rote learning and meaningful learning. In meaningful learning, learners store new information in long-term memory along with similar and related knowledge in order to remember and understand the new knowledge; it takes place when learners consciously integrate new knowledge into the relevant concepts they already possess.

By contrast, in rote learning, acquisition and retention of new knowledge are not facilitated and students make very little or even no connection between new knowledge and prior knowledge. To this extent, the subsumption involved in concept mapping can encourage a meaningful learning environment as it allows students to recognise new concepts based on the pre-existing concepts on the map.

The second theory underpinning concept mapping is constructivist theory (Bada, 2015). Elliott et al. (2000) defined constructivism as "an approach to learning that holds that people actively construct or make their own knowledge and that reality is determined by the experiences of the learner" (p. 256). This theory holds that learning is an active process; knowledge is constructed rather than innate or passively absorbed. The fundamental idea of this theory is that students bring their previous knowledge and personal interpretations of experience to the classroom and construct new knowledge based on them. According to Tobias and Duffy (2009), it is important to note that constructivism is not a specific learning method. Constructivism is a theory that describes how people learn, regardless of whether

they are using their experiences to understand a lecture or following instructions to build an object. Simply put, Constructivism theory suggests that learners construct knowledge from their experiences which then creates new information (Tobias & Duffy, 2009).

Bada (2015) stated that students' cognitive development involved the so-called "zone of proximal development" (Vygotsky, 1978, p. 86), which refers to the intersection between students' experience and the application of their experience in a new context. According to this view, meaningful learning takes place when students are actively engaged in the learning process and integrate their personal experience to build meaning and knowledge (Tajeddin & Tabatabaei, 2016). Some educators, following Vygotsky, believe that the role of education is to provide learners with experiences that are within their zones of proximal development, thereby inspiring and pursuing their learning such as skills and knowledge (Tajeddin & Tabatabaei, 2016; Tobias & Duffy, 2009).

The third underpinning theory of concept mapping is dual coding theory, according to which, information is processed and stored in memory in two forms: a linguistic form (words or statements) and a non-linguistic visual form (mental pictures or physical sensations) (Paivio, 2006; Sadosski & Paivio, 2013). Verbal and nonverbal processing are distinct but mutually related; verbal stimuli can activate nonverbal processing and, vice versa, nonverbal stimuli can activate verbal processing (Sadosski & Paivio, 2013). As a graphical learning tool that visually represents students' understanding of the text, concept mapping involves verbal information through the concepts and nonverbal information through the map's visual form.

Cognitive development is defined as qualitative changes in thought systems, with the source of change varying between the properties of the internal structural system and the organized system provided by the external environment (Lawton et al., 1980). Novak's work is based on David Ausubel's cognitive theories, which emphasise the importance of prior knowledge in

learning or assimilation of new concepts (Bada, 2015). Ausubel also emphasises the importance of meaningful rather than rote learning, as well as reception rather than discovery learning. Rote memory is used to recall object sequences such as phone numbers. It is, however, useless to the learner in understanding the relationships between the objects (Bada, 2015). Because meaningful learning entails recognizing the connections between concepts, it has the advantage of being transferred to long-term memory. The most important aspect of meaningful learning is how new information is integrated into the existing knowledge structure. While constructivists believe that learning occurs by constructing one's knowledge from prior experiences (Bada, 2015). Constructivist theorists such as Piaget argue that learning is developmental in the sense that people make sense of their world by integrating, accepting, or dismissing new information (Kirschner et al., 2006). Both were based on Jean Piaget's theory of cognitive development, intelligence changes as children grow. A child's cognitive development entails more than just acquiring knowledge; the child must also create or construct a mental model of the world (McLeod, 2020).

While Vygotsky would rather not discuss stages at all, instead of viewing development as a continuous process (Bada, 2015; Woolfolk, 2004). It has been argued that social interaction is essential for cognitive development. According to Vygotsky, a child's learning always takes place in a social context and collaboration with someone more skilled. This social interaction provides opportunities for language, and Vygotsky considered language to be the foundation of thought (Huang, 2021).

Piaget would argue that the teacher should provide opportunities that challenge the children's existing schemas and encourage the children to discover for themselves (McLeod, 2020). Alternatively, Vygotsky would recommend that teachers use scaffolding to help the child progress through the zone of proximal development. Whilst researchers stated that a person

can expand on learned material in two ways: verbal associations and visual imagery (Paivio, 2006; Woofolk, 2004). According to dual-coding theory, information is represented using both visual and verbal information (Paivio, 2006). Learners' visualisation is important to their cognitive development since they can actually 'see' their thoughts in the visual forms, and they can also keep track on their thinking process through the visualisations. Regardless of the theories used, it is noted that the relationship between learners' visualisation and learning concepts is important to their cognitive development.

Concept mapping tool is one such visualisation tool that potentially enhances the learners' representation of ideas, interaction with peers and instructors of their ideas. The three theories just mentioned inform the current study. Knowledge construction can take place through a process of assimilation; students construct and process new knowledge based on how the new information is related to their prior knowledge; and, since information can be processed and performed in different forms, students can present concepts in verbal form (as in texts) or non-verbal form (as in pictures, videos, etc.).

2.2.2 Computational concept mapping

Computational concept mapping (CCM) combines concept mapping and technology; students manipulate concept map construction on computers instead of using paper and pencils. CCM can facilitate students' concept map construction by scaffolding their concept mapping process and encouraging learning autonomy. The scaffolding helps novice students reduce their cognitive load (Chang et al., 2001) and provides orientation guidelines for map construction (Asiksoy, 2019). Computer-assisted concept maps are more adaptable and less constrained than traditional paper methods, allowing for the analysis and synthesis of more complex topics and larger amounts of data. The ability to iteratively revise and

collaboratively create computerized maps can help with interpersonal learning (Mammen, 2016).

Moreover, according to Liu et al. (2010), CCM helps students construct concept maps more quickly, especially when presenting a large number of concepts, because electronic maps transcending normal page sizes are easy to create. In contrast, the paper-and-pencil technique limits the number of concepts to the paper size. In addition, concept map correction is easier with CCM as it allows students to quickly change their maps by adding, correcting or deleting nodes and links. Asiksoy (2019) has also suggested that CCM is more convenient for communicating with peers because students can obtain precise information by showing their concept maps on the screen to each other and then discussing them.

In the specific context of EFL reading comprehension classes, Fageeh (2018) involved 60 EFL college students in a controlled experiment. The experimental group used CCM strategies for presenting the reading passages and themes, while the control group studied the themes using conventional methods. Results showed that not only did the experimental group outperform the control group in the post-test on reading comprehension, CCM had a positive influence on these EFL students' reading comprehension. Bruillard and Baron (2000) compared CCM with writing that used a word processing program and found that CCM made construction and revision easier. It also allowed students to customise their concept maps in ways that would be impossible using the paper-and-pencil approach.

While the literature shows that CCM has been used effectively for reading comprehension (Asiksoy, 2019; Chang et al., 2001; Fageeh, 2018; Liu et al., 2010; Omar, 2015), several researchers have focused on the influence of CCM on students' conceptual understanding within specific knowledge domains, for example, Asiksoy (2019) with engineering students,

Omar (2015) with English for Special Purposes (ESP) classes, and Chang et al. (2001) with science classes.

In regard to the influence of CCM on EFL students' text comprehension, Liu et al. (2010) conducted a study involving 192 first-year EFL college students in Taiwan. Two control groups and two experimental groups were taught by the same teacher. The experimental groups were exposed to CCM and the control groups to traditional approaches. After 10 weeks of the study, the results showed that the experimental groups outperformed the control groups. The study also found that CCM positively influenced the students' use of learning strategies; they tended to apply various reading strategies (e.g., inferring, summarising, elaborating, evaluating, reviewing) once they were trained in the CCM reading strategy instructions "reviewing" and "elaboration". Liu et al. (2010) argued that because CCM allowed the students to make unlimited changes to their concept maps, they had more opportunities to review their maps and elaborate on them.

2.2.3 Computational concept mapping in an authentic learning context

In this study, the intervention used during the reading course was computational concept mapping in an authentic learning context (CCMAL), which results from the integration of three strategies: concept mapping, computer-based learning, and authentic learning. The links between these constructs and metacognition have been documented (Azevedo & Aleven, 2013; Lombardi, 2007; Nosratinia et al., 2013). According to Stamps (2004), authentic learning is about connecting students to relevant real-life issues and problems. For Lombardi (2007), authentic topics are those that students think of as "real" or "genuine". The current study regards authentic learning as stemming from the relevance of the text topics to the participating students' daily life knowledge.

The influence of the reading topics on students' reading outcomes can be explained by schema theory, which suggests that for students to comprehend a text, they need to combine their own background knowledge with the information conveyed in the text. Schema theory conceptualises that all knowledge is packed into units, and these units are schema (McVee et al., 2005). This implies that when the reading topic of the text is familiar to students, their schema are more effectively activated and thus their comprehension is facilitated.

The relationship between metacognition and reading comprehension is well established (Channa et al., 2015; El-Koumy, 2004; Kraayenoord, 2010; Shikano, 2014). The influence of concept mapping on EFL students' metacognition has also been investigated in several studies (Nosratinia et al., 2013; Trang, 2017). However, there has been little research into the influence of CCM on students' metacognition while they are comprehending authentic texts. The current study's CCMAL intervention combined concept mapping, a technology platform for learning, and authentic learning to bring forth the advantages of each on EFL students' metacognition in reading comprehension classes.

2.2.4 Learning experience

According to Inamdar and Rathod (2012), learning means modifying and changing one's behaviour to achieve a goal. During the process of learning, learners obtain new information based on which they modify their behaviours through experiences. In Ammigan et al. (2021), learning experience is defined as any experience that transforms learner insights, supports emotional growth and builds knowledge, skills as well as dispositions. Learning experience can come in any number of settings and contexts, planned or unplanned.

Mirhadizadeh (2016) maintained that factors influencing students' L2 learning experience included both internal factors and external factors. Internal factors are those elements that

each individual brings to the learning context (e.g., students' interest, motivation, intelligence, etc.). These components are influenced by other factors that persist in the environment in which a learner lives which are known as the external factors.

In terms of internal factors, Calvo and Markauskaite (2010) found that students' individual difference was a prominent factor influencing their learning experience. In congruence, Renandya (2013) claimed that students' perceptions of the learning could affect their experience during the course. The researcher argued that students' perceptions about learning might influence their confidence during the learning process. In language classes, more confident students tend to perform better than those with little confidence (Tuncel, 2015).

In a specific context to a reading comprehension class, students' learning experience is heavily dependent on their background knowledge (Anohina-Naumecca, 2013; Broek et al., 2005; Thu & Ha, 2019). Especially, students' learning experience via concept mapping activities is closely related to the relevance between the topics of the reading text and their prior knowledge (Anohina-Naumecca, 2013). Anohina-Naumecca (2013) argued that concept mapping encourages students to integrate new concepts into their knowledge structure through relating concepts in the concept map. When students read a reading text with a familiar topic, they can embed new concepts in their pre-existing knowledge; therefore, better comprehend the text. Accordingly, students with little prior knowledge might have problems with connecting new information to their prior knowledge which might lead to the failure in making sense of newly acquired information (Broek et al., 2005).

Smith et al. (2021) explained students' learning experience through the role of domain knowledge and based on the schema theory. Smith and his colleagues assumed that domain knowledge, which refers to knowledge of a specific and defined field, is a subset of background knowledge. Domain knowledge is stored in long-term memory as a series of

propositions. Students' understanding of a particular concept is comprised from connecting and organising these propositions. During the reading process, the schemata which are related to the reading text are activated to contribute to the construction of the situation model. As a consequence, it is possible that students with insufficient knowledge that is required for a proper integration of the text base fail to construct an effective situation model. This leads to the difficulties in understanding the reading text (Kendeou et al., 2014; Kendeou et al., 2016).

Knowledge and experience are two inextricably linked concepts; experience is believed to be the antecedent for knowledge (Smith et al., 2021). Therefore, students' experience in concept mapping is assumed to be a factor influencing their concept mapping during the reading process. Anohina-Naumecca (2013) asserted that concept mapping represents students' knowledge of a domain; hence, it requires the changes in ways of thinking so that a whole picture of their knowledge of a domain can be seen. During the concept mapping process, students have to relate their prior knowledge to the new concepts. As a result, the more experienced students are in concept mapping, the more their concept mapping process is facilitated.

Regarding learning style, Novak and Canas (2007) explained that students who are familiar with rote learning may have difficulties in concept mapping at least at the beginning stage. This is because these students might expect the continuing of rote learning. In contrast, concept mapping requires them to actively engage in learning as it exposes them to new learning patterns that are meaningful and helps them connect prior knowledge and new concepts. Yet, such changes might cause struggles in concept mapping.

From an Assimilation theory's perspective, the more prior knowledge and experience students have in concept mapping, the easier it is for them to conceptualise and manipulate concept map construction. This is due to their prior experience with concept mapping, which

provides them with the foundational skills needed to scaffold their map construction. Cassata and French (2006) asserted that concept map construction requires such skills as identifying key concepts, connecting concepts, or organising concepts on the concept map, etc.; these skills are different from what students have established during rote learning. Consequently, students' prior experience in concept mapping can facilitate the manipulation of concept map construction (Cassata & French, 2006; Novak & Canas, 2007).

With regards to external factors, research showed that that students' learning experience can be influenced by learners' individual difference (Calvo & Markauskaite, 2010; Renandya, 2013), learning activities (Bautista, 2016; Bovill et al., 2011; Calvo & Markauskaite, 2010; Chalapatia et al., 2018), teaching staffs (Calvo & Markauskaite, 2010; Chalapatia et al., 2018), learning materials (Chalapati et al., 2018; Thu & Ha, 2019), and other physical factors such as classroom, noises, etc. (Calvo & Markauskaite, 2010). Moreover, Renandya (2013) argued that EFL learning experience can also be influenced by cultural and affective factors which are related to the target language.

As an activity in reading comprehension classes, concept mapping is described as a process of visualising knowledge (Canas et al., 2004). Visualisation can assist students in organising and reorganising their knowledge, as well as structuring and restructuring it (Tergan & Keller, 2005). Visually presenting knowledge can also assist students in evaluating, expanding, and communicating their ideas and thoughts about relevant contents and resources. Furthermore, visualising knowledge may assist students in overcoming issues related to working memory limitations, as well as the capacity and duration of stored information (Ishai & Sagi, 1997). As a result, knowledge visualisation may reduce students' cognitive load and expand their memory capacities for coping with tasks that have complex cognitive requirements (Novak & Canas, 2007). Put simply, the utilisation of a visualisation

tool for representing knowledge is effective as it helps students 'see' their understanding of a matter. Additionally, it helps students keep track with the changes in their mind by looking at how the concepts are arranged and rearranged. Notably, the visual form of knowledge may reveal students' misconceptions. Thus, a knowledge visualisation tool is important to students' cognitive development.

During concept mapping, the features of the software that they use for constructing the concept map, as a part of the classroom activity, can influence students' learning experience, too. The proposed concept mapping software is Cmap tools. The key tenet of this concept mapping tool is *low threshold, high ceiling* (Canas et al., 2004, p. 4). The term 'threshold' can be understood as how difficult it is to learn to use Cmap tools while the term 'ceiling' refers to how much can be accomplished using Cmap tools. This tenet implies that while Cmap tools is easy to learn, it also provides a setting for the creation of advanced concept map.

Novak & Canas (2007) described Cmap tools as a user-friendly software because the instructions were presented in the form of icons, which aided students in quickly learning how to use it. Simultaneously, Cmap tools also enabled students to create concept maps with advanced features such as customising nodes, links, fonts, or text sizes, among other things. In other words, the interface and the functionality of Cmap tools were simple to use for inexperienced users with technical knowledge. Yet, it supported the construction of advanced concept maps by more expert mappers.

Notably, Cmap tools allows bot textual and visual representations of concepts. Students can present the concept in either words or pictures/ videos. This feature of Cmap tools can be considered through the lens of Cognitive Flexibility. According to Lee (2014), Cognitive Flexibility theory supports the use of multiple representations for concepts. Spiro and Jehng

(1990) defined Cognitive Flexibility theory as the ability to spontaneously remodel knowledge in response to changing situational demands. Due to Spiro et al. (2003), the use of multiple representations of concepts facilitated students' understanding of complex words as it helped students consider the concepts from different perspectives.

It can be said that Cmap tools is a potential learning tool as its affordances facilitate students' cognitive development and enrich their concept mapping experiences.

2.3 Reading comprehension: A cognitive perspective

A cognitive perspective was considered appropriate for this study's inquiry into how CCMAL influences EFL college students' reading comprehension and metacognition. Proponents of this perspective are interested in reading as the process of constructing a "coherent mental representation of the text in the readers' memory" (Kendeou et al., 2012, p. 1). This mental representation is constructed based on the textual information and readers' prior knowledge (Kendeou et al., 2014).

According to Veeravagu et al. (2010), reading comprehension is

> a thinking process by which a reader selects facts, information, or ideas from printed materials; determines the meanings the author intended to transmit; decides how they relate to previous knowledge and judges their appropriateness and worth for meeting the learner's own objectives. (p. 206)

This definition coheres with Hellekjær's (2007) notion of reading comprehension as "decoding the written text on the one hand and efficiently processing the information on the other hand" (p. 2). A conception common to these definitions is that reading comprehension is constructed through a reciprocal and holistic interchange between the interpreters and the messages; it is not merely the recall or regurgitation of the information conveyed in the

reading text but also a reciprocal process where readers bring something to the reading comprehension (e.g., their prior knowledge, experiences). Hence, it is not only the textual information that can influence a reader's comprehension, the information they already possess can also influence their meaning construction.

Grabe (2009) has asserted that reading comprehension is the simultaneous interaction between the readers and the texts; it is not merely a cognitive process, it is also a strategic, "interactive process among the reader, the text, and different processes that gradually and flexibly adjusts to the reading situation" (p. 8). This definition highlights the importance of the activities that reading comprehension is a part of. In other words, how students construct meaning from a text will be influenced by the textual information, their prior knowledge, and their use of reading comprehension skills.

According to Grabe (2009), reading comprehension also involves the abilities to

- recognise words rapidly and efficiently;

- develop and use an extensive recognition vocabulary;

- process sentences in order to build comprehension;

- engage a range of strategic processes and underlying cognitive skills (e.g., setting goals, changing goals flexibly, monitoring comprehension);

- interpret meaning in relation to background knowledge;

- interpret and evaluate texts in line with reader goals and purposes;

- and process texts fluently over an extended period of time.

These processes and knowledge resources allow readers to generate text comprehension to the level required. This means that the reading comprehension skills that students use could

help indicate their reading comprehension ability. In this study, students' reading comprehension skills and strategies are analysed for better understanding of their reading comprehension.

2.3.1 Reading models

Although both reading comprehension skills and reading comprehension strategies are distinct techniques readers use for understanding texts, these terms are often used interchangeably by researchers and educators. According to Afflerbach et al. (2008), reading skills are defined as the "automatic actions that result in decoding and comprehension with speed, efficiency, and fluency and usually occur without awareness of the components or control involved" (p. 368). Readers perform these skills automatically and without deliberate control or conscious awareness.

In contrast, reading strategies are "deliberate, goal-directed attempts to control and modify the reader's efforts to decode text, understand words, and construct meanings of text" (Afflerbach et al., 2008, p. 368). In other words, deliberate control, goal-directedness and awareness allow the reader to select a particular path towards a reading goal and the means to reach it. In learning situations, reading strategies require more conscious awareness from students than reading skills, but this does not make them more onerous or better. Furthermore, reading strategies are not always successful. For instance, a student in a hurry to finish a reading task might select the strategy of reading quickly rather than carefully.

This sub-section describes three reading models. These are the bottom-up model, the top-down model, and the interactive model. The reading comprehension strategies included in these models are also elaborated.

2.3.1.1 The bottom-up model

The bottom-up reading model focuses on the reader identifying and decoding letters and words in a text to understand their meaning before proceeding to the next sentence and discourse level for reading comprehension (Noor, 2016). In this model, readers analyse the text from smaller units to broader ones; that is, the meaning of the text is constructed through the process of building letters into words, words into sentences and sentences into text (Davoudi & Moghadam, 2015). Once these parts have been designed and developed, they are linked together to form a larger component (Lynch, 2021).

However, this model has been criticised for being a "linear" model that fails to consider a student's background knowledge (Davoudi & Moghadam, 2015; Noor, 2016; Shahnazari & Dabaghi, 2014). Shahnazari and Dabaghi (2014) have argued that the bottom-up model is inadequate for explaining the reading process as it only takes into consideration the lower levels of reader processing, such as word identification. It also fails to describe the high-level processing that may influence a readers' comprehension, such as drawing on their prior knowledge and experience. These limitations have led to the development of the top-down model.

2.3.1.2 The top-down model

In the top-down model the reading process is supported chiefly by the reader's background knowledge and prior experience. In this model, the reader focuses on the meanings of the words or the text rather than the phonemic representation of the words (Davoudi & Moghadam, 2015). That is, the meanings and context provide the clues to identify the words.

The Top-Down approach is also known as breaking the larger problem into smaller problems and solving them individually in a recursive fashion (Lynch, 2021). According to Noor

(2016), readers who use a top-down approach to construct meaning from the text use strategies such as summarising, anticipating and relating it to their general knowledge. Top-down processing has also been called "reader driven" (Davoudi & Moghadam, 2015, p. 173), as readers bring meaning to the text based on their experiential and interpretive prior knowledge. The difference between top-down and bottom-up processing is that in the top-down model readers do not use all the information in the text when they read it. Instead, they select relevant information in the text according to their purpose for reading.

Nevertheless, the top-down model has been criticised for its over-reliance on a reader's background and knowledge to the detriment of the broader text and context. It does not emphasise word recognition skills or take into account the processing of lexical and grammatical features of the text (Davoudi & Moghadam, 2015). A further criticism, which is particularly relevant for EFL students, is its potential difficulties in predicting the topics of unfamiliar texts and materials. These criticisms have led to the development of the interactive model.

2.3.1.3 The interactive model

The interactive model combines the previous two models to indicate that the reading process is supported by the interaction between the information in the text and the reader's background; it emphasises the relationship between the reader and the text. Here, reading is defined as a process in which the reader actively engages in the reading process to construct the meaning of what is being read (Noor, 2016; Shahnazari & Dabaghi, 2014). This model is considered the most conclusive method for successful reading comprehension. For example, Fu (2016) has stated that in the interactive reading model, both the sensory and non-sensory come together in one place and the reading process is the conclusion of simultaneous joint application of all the knowledge sources.

Furthermore, researchers have described interactive reading as the interaction between the different levels of processing (Broek et al., 2005; Grabe, 2009). For Grabe (2009), reading comprehension involves interactions between lower comprehension skills (e.g., recognition of lexical and grammatical units), and higher comprehension skills (e.g., using context and background knowledge for inferencing, monitoring comprehension or setting goals). Noor (2016) advocates for the interactive model as it postulates that reading comprehension occurs when there are interactions between the text, the reader, and the activities in which reading comprehension is a part.

Broek et al. (2005) developed a three-level reading model based on the interactive approach:

Level 1 – Literal statements: These are at the surface of a text, and readers search for information within the text. Literal comprehension skills include locating information directly in text or visual images; in titles, captions, headings or e-texts; and in a sentence that is directly stated in the text.

Level 2 – Interpretive statements: This involves reading between the lines, where readers combine literal information with other information contained in the text, or with their previous knowledge and experience. Interpretive processing skills include sequencing events from a text; extracting information from a visual cue (e.g., map, key for a map, diagram, photo); connecting information in a text or a visual image (e.g., a diagram or illustration, titles, captions and headings) to complete the answer; and making connections between information in the text.

Level 3 – Inferential statements: These are at a level beyond the text, where readers use literal and inferential information and combine it with previous knowledge and experience to make generalisations and form their own theories and ideas,

particularly when it comes to determining whether the information is true or false. Broek et al. (2005) refer to this level as "the critical level". Inferential processing skills include inferring the meaning of information in texts; deducing main ideas, themes and concepts; contextualising unfamiliar words; and identifying the purpose and meaning of metaphorical language devices (e.g., similes).

According to Shahnazari and Dabaghi (2014), the interpretive and inferential processing levels are key components for analytical and critical thinking because readers must go beyond the information in the text to test it against their own knowledge and experience, as well as those of others, before accepting its validity or accuracy and to connect different information across sentences, paragraphs and chapters. Soto et al. (2019) have explained:

Generating inferences is perhaps the most important mental operation in the construction of the situation model. Inferential processes result in readers generating information that is not directly stated in the text (i.e., by invoking prior knowledge). Importantly, this new information yields deeper understanding because readers include these semantic elements in their mental representation of text information. (p. 3)

In other words, understanding is not dependent solely on information presented in the text, whether explicitly stated or appearing across multiple clauses in the text; instead, readers are required to hold that information in their working memory and simultaneously access information, knowledge, or experience from their long-term memory to analyse or evaluate what they have just read, thereby increasing the demands on their cognitive processing.

Although Soto et al.'s (2019) model highlights the significance of inferential comprehension, it overlooks the role of evaluative comprehension. Evaluative comprehension provides

students with skills to justify their opinions, argue for a particular viewpoint, critically analyse text content and determine the author's position (Basaraba et al., 2013). Because meaning construction is heavily dependent on the reader's prior knowledge, evaluative comprehension demands more of the reader and thus represents a higher-order understanding of a text.

2.4 Metacognition

So far, metacognition has been investigated by cognitive psychologists (Akturk & Sahin, 2011; Flavell, 1979; Kuhn & Dean, 2004; Lai, 2011) and social psychologists (Tsai, 2001). Flavell (1979), who pioneered research into metacognition, coined this term in the late 1970s to refer to "cognition about cognitive phenomena" (p. 906). This is perhaps the most straightforward definition of metacognition, but it requires further elaboration since it focuses only on the cognitive state of metacognition, while metacognition also involves reflection and analysis of thought (Noushad, 2008). Putting more attention on the executive aspect of metacognition, Martinez (2006) has described metacognition as the monitoring and controlling of thoughts. Similarly, for Parrish and Brosnan (2012), metacognition is a process in which learners consciously monitor and adaptively control their cognitive processing. Nevertheless, the role of cognitive awareness is underestimated in these definitions.

In this study, metacognition is defined as the "awareness and management of one's own thought" (Kuhn & Dean, 2004, p. 270). For Kuhn and Dean (2004), metacognition enables students to retrieve the strategies they learned by solving a particular problem and to deploy them in similar but new contexts. This definition involves both dimensions of metacognition: cognitive states and executable processes. In addition, Kuhn and Dean's conceptualisation of cognitive management involves the use of various metacognitive skills, including planning, monitoring and evaluation. It also involves the different stages that students experience

"before the processes", "during the processes" and "after the processes" (when evaluation of the processes occurs). Metacognition entails that reflecting on one's thought processes, such as study skills, memory abilities, and the ability to monitor learning will regulate the processes that will maximize our learning (Lai, 2011). This is meaningful in the reading comprehension process, which also comprises three phases: pre-reading, while-reading, and post-reading.

In reading comprehension, metacognition refers to the reader's awareness of the strategies that support their comprehension and how to carry out these strategies effectively. Metacognitive reading strategies are the cognitive strategies used consciously and deliberately to control text comprehension. Metacognition is significant for learning reading comprehension because if learners are not aware their comprehension is breaking down and what they can do about it, strategies introduced by the teacher will fail (Karbalaei, 2011).

2.4.1. Metacognitive models for reading comprehension

Since metacognition may be defined as "thinking about thinking" (Flavell, 1979, p. 908), metacognition in reading comprehension can be understood as "thinking about reading" (Shikano, 2014, p. 14). A reader's comprehension is affected by metacognition; their "actual reading" can be constituted by their interactions with the text, their mental pictures and their use of metacognitive strategies (Shikano, 2014, p. 14). Metacognitive reading strategies are broadly defined as the "deliberate, conscious procedures used by readers to enhance text comprehension" (Karbalaei, 2011, p. 7). To complete the task of text comprehension, readers must employ metacognitive knowledge as well as conscious and deliberate strategies (Karbalaei, 2011). Readers' metacognitive knowledge about reading can be influenced by a variety of factors, including previous experiences, beliefs, culture-specific instructional practices, and, in the case of non-native readers, proficiency in their second language, and it

can be triggered, consciously or unconsciously, when they encounter a specific reading task (Karbalaei 2011; Lai 2011).

Metacognition primarily consists of two elements: knowledge or awareness about cognition, and management of cognition (Amzil & Stine-Morrow, 2013; Kuhn & Dean, 2004). Both elements have a crucial role in the reading comprehension process. Researchers have incorporated both elements into the following metacognitive reading comprehension models. The following sections present two metacognition models which were developed for reading comprehension.

2.4.1.1 The Strategic Iterative Reading Comprehension Approach (SIRCA)

González (2017) has developed the Strategic Iterative Reading Comprehension Approach (SIRCA) for EFL college students. This model aims to build up a set of strategies that students can use to consciously regulate their reading comprehension process. In accordance, it proposes that students' reading comprehension is influenced by three factors: textual indicators, strategy instruction, and content learning.

Besides, Gonzalez found that teaching students textual indicators (e.g., prefixes, suffixes, parts of speech, etc.) can provide them with alternative ways to decipher meaning when their vocabulary and syntactical knowledge are insufficient. To do this, it is necessary to make explicit the cognitive, metacognitive and social-affective strategies that students can use during text comprehension. With this set of strategies students can quickly and effectively find and explore the section of the text that is useful to them. Moreover, with SIRCA the cognitive demand of the reading text should be ascending. This means that the level of difficulty of the texts should increase as students become more proficient in using strategies and developing a greater store of discourse markers.

The SIRCA model includes cognitive strategies, metacognitive strategies and social-affective strategies. Specifically, the cognitive strategies for reading comprehension include relating new information to prior knowledge or relating different parts of new information to each other, classifying words and terminology according to their attributes (grouping), writing down key words and concepts in abbreviated verbal or graphic form while reading (note taking), using textual information to predict outcomes or guess meanings (inferencing), making a written summary of information gained through reading (summarising) and using previous knowledge or skills to assist comprehension (induction).

Similarly, the metacognitive reading strategies inlude planning, self-monitoring and regulating of knowledge processing. The social-affective strategeis include self-talk, using mental techniques that make one feel competent to the learning task, cooperating with peers to solve a problem, pooling information, checking a learning task and elliciting feedback on interpretation of form or content of the text.

Although the SIRCA model aims to increase students' use of metacognitive reading comprehension strategies, it depends heavily on cognitive strategies and social-affective strategies. Whereas, only some metacognitive skills are mentioned in this model, such as planning (selective attention), self-monitoring (elaboration) and regulating of knowledge processing.

2.4.1.2 Metacognitive Reading Comprehension Strategies Model (MRCM)

The awareness of metacognitive reading strategies is important in both reading comprehension and the educational process. Despite its importance, metacognitive strategy has long been an overlooked skill in English language teaching, research, learning, and assessment (Ahmadi et al., 2013). Emphasising the use of metacognitive strategies in reading

comprehension, Channa et al. (2015) proposed the Metacognitive Reading Comprehension Strategies Model (MRCM). The current study used MRCM as its theoretical framework because it was developed in the specific context of reading comprehension classes and it focuses on the use of metacognitive management strategies for planning, monitoring and evaluation, which are relevant to the three reading comprehension phases: pre-reading, while-reading, and post-reading. Moreover, this model has been used for investigating EFL students' metacognition in reading comprehension by Channa et al. (2018). In Channa et al. (2018), 40 first-year students in a Pakistani college were involved. The research context of Channa et al.'s (2018) study is highly relevant to the context of the current research which aims to examine first year students' metacognition in reading comprehension in a Vietnamese university.

2.4.1.2.1 Metacognitive strategies for planning

In the pre-reading phase, metacognitive skills include setting goals, anticipating the content of the reading text before reading, dividing time for reading, and carefully reading the enquiries for a finer text recognisance. The MRCM suggests that anticipation is used before reading to activate readers' prior knowledge and to build curiosity about a new topic. Readers' anticipation can be based on both textual and visual hints from the text (e.g., titles, pictures). Defrioka (2013) found that in reading comprehension classes anticipation helps stimulate students' interest in a topic and sets a purpose for reading. Predicting the content of a text before reading it can also arouse students' curiosity and provide them with a purpose and a focus as they read.

According to El-Koumy (2004), planning in reading comprehension requires making a comprehensive plan for dealing with the text at hand. This helps readers clarify their reading purposes and stimulate their interests (El-Koumy, 2004), activate different types of schema

(Alfaki & Siddiek, 2013) and foster motivation to discover what might be occurring in the text (Azizifar et al., 2014). In other words, readers need to think about their purpose for reading as they prepare for it. They can read for different purposes, such as entertainment, knowledge construction, or information gathering, but, as El-Koumy (2004) has asserted, if readers do not know their reading purposes quite well, reading is nothing more than allowing the eyes to scan the print.

While planning for reading, readers can judge the relevance of the text to a specific topic, predict the content of the text, evaluate its the difficulty level, and propose appropriate strategies for task completion (Azizifar et al., 2014; Marinaccio, 2012). In an empirical study with 40 EFL college students, Alfaki and Siddiek (2013) found that schema-based pre-reading activities activated students' prior knowledge and thus facilitated their reading comprehension. This implied that the similarity between the text topics and students' prior knowledge could influence their reading comprehension.

Correspondingly, El-Koumy's (2004) research on the planning strategies used in reading comprehension classes revealed the differences in how good and poor readers plan for reading. The good readers used more planning pre-strategies than the less successful readers. Specifically, they tended to use text aids such as pictures and diagrams to anticipate the writer's ideas before reading the text. The good readers could also determine the purposes for reading better than poor readers. In other words, El-Koumy (2004) believed that good readers tend to use more metacognitive strategies before reading a text than poor readers. Consequently, enhancing students' use of metacognitive strategies for reading comprehension is likely to improve their reading comprehension.

2.4.1.2.2 Metacognitive strategies for monitoring

With regard to monitoring strategies, Chana et al.'s (2015) MRCM includes think-aloud, self-questioning, and self-regulated learning strategies. Think-aloud is a metacognitive strategy that can be considered from different perspectives: it can be a reading comprehension instruction for the teacher, or it can be a learning strategy for students (Kucan & Beck, 1997; Seyedi, 2012). In thinking aloud protocols, students verbalise how they are processing the text they are reading; hence, thinking aloud is also referred to as "student verbalisation" (Kucan & Beck, 1997, p. 280). Seyedi (2012) has suggested that getting students into the habit of thinking aloud can bring them various benefits. First, thinking aloud protocols provides rich information about students' problem-solving – the difficulties they are encountering; how they intend to solve the problems; and to what extent and in what contexts they use specific strategies in a learning task. Second, by externalising students' thoughts, thinking aloud can be used as a diagnostic tool to analyse students' strengths and weaknesses in reading since it reveals rich information about how students carry out unobservable mental activities. Besides, as students think aloud with their teacher and peers while solving problems, they gradually internalise the dialogue. Thus, the dialogue becomes their inner speech, through which they can direct their own problem-solving process (Seyedi, 2012). Therefore, when students think aloud, they become more reflective, metacognitive and independent readers through the problem solving and reading comprehension processes.

Additionally, MRCM includes self-questioning as a monitoring strategy during reading. According to Joseph et al. (2016), self-questioning interventions require students to monitor their own reading comprehension by asking themselves a series of self-generated or teacher-provided questions before, during, and after reading a passage. This helps students focus on

the critical information in the text. In addition, answering a series of generic questions gives students reasons for reading and thus enhances their interactions with the text.

Moreover, self-regulated learning strategies may also be used as monitoring strategies during the while-reading phase. Metacognition and self-regulated learning are closely related (Zhang & Zhang, 2019). For Zimmerman (2015), self-regulation itself is not a unitary construct; metacognitive strategies are a vital aspect of self-regulated learning. This study drew on Zimmerman's (2015) self-regulation learning model for specific self-regulated learning strategies because it has a strong basis in metacognition (Panadero, 2017). It includes three phases: forethought, performance, and reflection. These phases are relevant to three phases of reading comprehension: pre-task, conducting task, and post-task. The strategies of the performance phase include imagery, time management, and help-seeking.

For Cumming and Williams (2012), imagery is a cognitive process fundamental to the monitoring of learning and performance. It has six main components: visual, auditory, gustatory, kinesthetic, olfactory, and tactile. Visual imagery is the ability to create mental pictures. The construction of mental images encourages the use of prior knowledge for creating vivid representations of prose (McDonald, 2001).

According to Sadosski and Paivio (2013), thinking can be a dual coding process in which verbal and nonverbal information is presented in distinct, but interconnected, mental systems. Verbal stimuli may activate the nonverbal processes, and vice versa (Paivio, 2006; Sadosski & Paivio, 2013). The verbal subsystem is specialised for dealing with printed, spoken, and written language, while the nonverbal subsystem is specialised for representing and processing information related to objects. As such, students were able to create mental images based on both textual and visual information.

In Zimmerman's (2009) model, help-seeking is a self-regulated learning strategy. Help-seeking is a "proactive, social behaviour intended to gain assistance from a knowledgeable individual in order to perform more effectively" (White, 2011, p. 25). White (2011) has classified students' help-seeking as instrumental (or adaptive) and executive (or non-adaptive). Instrumental help-seeking refers to students seeking only as much assistance as is necessary to learn to complete a task successfully, for example by asking for hints or giving themselves more time to solve the problem. By contrast, executive help-seeking refers to students requesting someone else to perform the task or give them direct answers. While instrumental help-seeking can enhance students' autonomy and long-term learning, executive help-seeking can enhance their immediate performance but not their long-term learning. Research shows that students' instrumental help-seeking behaviours, along with their perceptions of its benefits, are positively related to their academic achievements, while executive help-seeking has a negative influence on students' learning progress (Karabenick & Berger, 2013; White, 2011).

Studies have shown a positive correlation between students' use of comprehension monitoring strategies and their reading performance. Gomez and Sanjosez (2012) invited 199 EFL students at a university in Spain to read six texts and complete an error detection test after each reading. They found that as their English proficiency level increased, the percentage of comprehension obstacles of a lexical nature detected by the students diminished, simultaneously increasing the percentage of correctly detected embedded semantic obstacles.

Also, reading comprehension is considered a problem-solving process (Olshavsky, 1977; Österholm, 2007). To understand the relationship between students' comprehension monitoring and their reading comprehension ability, Olshavsky (1977) asked 14 college

students to reflect on their comprehension process during text comprehension. These students viewed reading as a problem-solving process; they simultaneously solved problems while comprehending the text. They were also asked to sit a reading comprehension test after the course and Olshavsky (1977) found that while the good readers could effectively reflect on their comprehension, the poor readers failed to do so.

2.4.1.2.3 Metacognitive strategies for evaluation

In correspondence to the post-reading phase, Channa et al.'s (2015) MRCM proposes five evaluation strategies: reviewing learning goals, evaluating accuracy in reading and credibility in comprehension; evaluating the appropriateness of reading materials; reflecting on personal attachment to the text for enjoyment; and determining students' self-progress in reading comprehension. A review of the literature suggests that self-evaluation has many advantages for students' reading comprehension and learning autonomy (Badrinathan, 2015; Gardner, 2000). It can enhance their learning motivation, which can increase their involvement in learning and thinking (Todd, 2002) and it can foster self-confidence and thus encourage them to see and fill the gaps in their own performance (Papanthymou, 2018).

Educators have suggested various frameworks for fostering students' use of evaluation strategies in reading comprehension classrooms (Anderson, 2001; Shaaban, 2001; Suhermanto, 2019). Based on the assumption that L2 learners are actively using metacognition when they attempt to evaluate whether what they are doing is effective, Anderson (2001) proposed a set of four evaluation questions for EFL reading comprehension contexts: (1) What am I trying to accomplish? (2) What strategies am I using? (3) How well am I using them? (4) What else could I do? Teachers can help students evaluate how they strategise by asking them to respond thoughtfully to these four questions.

Subsequently, Anderson (2001) explained that by responding to these four questions, EFL students can integrate the three aspects of metacognition (planning, monitoring, and evaluation) and thus reflect through the cycle of learning. The first question relates to preparing and planning for reading comprehension, the second to selecting and manipulating particular strategies, the third to evaluating the strategy use, and the fourth to future actions. However, this framework only focuses on general comments and fails to produce a list of specific criteria for evaluation. Question 4, in particular, does not help students construct a list of strategies for fixing reading problems in the future.

With more focus on fixing the reading failures that students might have had during their text comprehension, Suhermanto (2019) has proposed five questions aimed at making students consciously aware of the problems they encountered and encouraging them to evaluate their own reading process: (1) What is the process you went through to accomplish this task? (2) What are the problems you encountered? (3) How does this activity relate to what you have learned before? (4) What are the strengths of your work? and (5) What still makes you uneasy? Suhermanto's (2019) framework can help students evaluate the process they used for completing the task, analyse their strengths and shortcomings, predict potential problems, and select appropriate strategies for other similar tasks.

Although the advantages of metacognition in reading comprehension have been widely disseminated, its potential disadvantages have only rarely appeared in metacognition research. Norman (2020) has suggested that students' metacognition might actively interfere with their task performance. Metacognition involves awareness of one's own ability, which is known as self-efficacy. However, self-efficacy might result in the sort of overconfidence that prevents students from realising their shortcomings or leads to non-optimal investment of their cognitive resources. In a reading comprehension class, students who are overconfident

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in their ability might have difficulty breaking down their comprehension and thus be unable to correct their failures. They might also select strategies that are inappropriate or beyond their ability. For Norman (2020), however, the benefits of metacognition to students' reading comprehension outweighed its negative influence. Actually, overconfidence is not a major issue; it is relevant that students ask the question, "Is the nature of the task such that it interferes with their performance?" before conducting a reading task based on their metacognitive experience.

2.5 The research gaps

A comprehensive review has been conducted on a large number of empirical studies about Vietnamese students' learning of EFL reading comprehension in the last ten years (from 2011 to 2021). A synthesis of the difficulties faced by students in reading comprehension classes is presented in the following table:

Table 2. 1: Reading Comprehension Difficulties Encountered by Vietnamese EFL Students

No.	Reading comprehension difficulties	Description of reading comprehension strategies
1	Reading strategies	Cognitive strategies (translating, summarising, using sources of references, etc.)
		Metacognitive strategies (setting goals for reading, selecting appropriate reading strategies for specific reading tasks, evaluating the reading process, etc.)
2	Language knowledge	Knowledge of vocabulary
		Knowledge of grammar (tenses, linking words, pronouns, etc.)
3	Background knowledge	Knowledge of specific areas (linguistics, archeology, politics, etc.)
4	Motivation	Internal motivation (reading for the individual's enjoyment of personal achievements, reading for

5	Other difficulties	Task timing, reading materials, etc.

		the individual's interest in the target language, etc.)
		External motivation (reading for a system of incentives, reading for publicly reported outcomes, etc.)
5	Other difficulties	Task timing, reading materials, etc.

As can be seen from the table, using reading comprehension strategies is one of the most frequent difficulties faced by Vietnamese students. Students encountered with using both cognitive and metacognitive reading skills (Chi & Vy, 2021; Hieu & Huong, 2021; Kien & Huan, 2017; Thao & Tham, 2018; Thuy, 2020). Especially, EFL students confronted difficulties in identifying, selecting, and practicing appropriate reading strategies (Thuy, 2020). Students' difficulty in identifying appropriate reading strategies was labeled to declarative knowledge which refers to their understanding of reading comprehension strategies. In other words, students' effective utilasation of metacognitive strategies during the reading process urges them to grasp their knowledge of reading strategies. Therefore, EFL students as readers should prepare themselves with individual knowledge of reading strategies (Chi & Vy, 2021; Thuy, 2020). Once students possess sufficient knowledge of reading strategies, they may select appropriate decoding and comprehending paths. The challenge in selecting reading strategies is due to procedural knowledge which refers to students' knowledge of how to process various reading strategies. It is necessary that students sharpen their procedural knowledge so that they can utilise reading strategies more strategically and effectively as the compensations for reading problems (Thuy, 2020). The difficulty in practising metacognitive strategies was related to conditional knowledge, in which effective utilisation of the target strategies requires students to capture when and why to apply different reading strategies. In brief, skilled readers are those who can select various

strategies most suitable for each given situation in an attempt to better regulate their reading process.

Generally, Vietnamese EFL students, as readers are moderate strategy users and they attempted to use various reading strategies in their reading comprehension classes (Ha et al., 2019; Hien & Phuong, 2018; Minh & Nga, 2019; Phuc, 2020; Thuy, 2018) The following table presents the reading strategies used by Vietnamese students.

Table 2. 2: Reading Strategies Used by Vietnamese EFL Students

No.	Reading strategies used	Description of the reading strategies
1	Cognitive strategies	Rereading the text
		Adjusting reading speed
		Visualising information in the text
		Going back and forth to connect information in the text
		Skimming and scanning
		Focusing closely on the content of the text
2	Metacognitive	Setting purposes for reading
		Using prior knowledge for comprehending the text
		Previewing the text before reading
		Deciding what to read and what to ignore
		Analysing and evaluating what is read
		Guessing the meaning of the text
3	Supporting strategies	Reading aloud
		Underlining and circling information in the text
		Translating into Vietnamese

As discussed in Chapter 1, English is taught as a compulsory subject from year 3 (new curriculum) and year 6 (old curriculum) in Vietnam. It means that students have studied English at least seven years before entering universities. Consequently, they may more or less have background knowledge of English. To some extent, they are aware of the importance of

the use of reading strategies for comprehending texts and therefore, they occasionally utilise the reading strategies while reading (Minh & Nga, 2019).

Although various reading strategies were used, these strategies were utilised in a different frequency by Vietnamese students. As reported, some of the most frequently used strategies included rereading the text (Minh & Nga, 2019; Thuy, 2018), skimming and scanning through the text, going back and forth for information and reading aloud (Minh & Nga, 2019; Phuc, 2020), focusing closely on the text content (Hieu & Huong, 2021). Meanwhile, some other reading strategies were reported to be the least interest; these reading strategies include setting purposes for reading (Minh & Nga, 2019; Phuc, 2020; Thuy, 2020), guessing the meaning of unknown words (Thuy, 2020); self-questioning (Minh & Nga, 2019); using prior knowledge for text comprehension (Phuc, 2020). Despite the fact that metacognitive reading skills are importance for reading comprehension, Vietnamese EFL students tended to use problem-solving and supporting strategies more frequently than metacognitive strategies during the reading process (Ha et al., 2019; Hieu & Huong, 2021; Minh & Nga, 2019; Phuc, 2020; Thuy, 2020).

As discussed earlier in this chapter, concept mapping has empirically proved to be an effective learning tool that can enhance students' metacognition in reading comprehension classes (Cassata & French, 2006; Khine et al., 2019; Liu et al., 2010; Omar, 2015; Trang, 2017). Nonetheless, in the context of Vietnamese tertiary education, there has still a gap in the studies using concept mapping in a technological platform in an authentic learning context as an intervention to enhance students' metacognition in reading comprehension. This study purposes to implement CCMAL, which lies in the intersection between three areas: concept mapping, technology and authentic learning to identify its influence on students' metacognition and thus, their reading comprehension.

2.6 The research framework

The focus of this study lies at the intersection of concept mapping, authentic learning and reading comprehension in the context of EFL. As has been noted earlier in this chapter, within the scope of this study, metacognition is understood as students' awareness of the strategies supporting their comprehension, and how to effectively implement these strategies (Karbalaei, 2011). Once students are aware of their reading comprehension process, they can select appropriate strategies to fulfill the tasks. Besides, good readers also realise arising problems and have fix-up strategies to solve these problems. Hence, students' metacognition plays a critical role in enhancing their level of text comprehension.

In this study, it is assumed that concept mapping is an effective learning tool that can positively influence students' metacognition. Concept mapping can be considered an effective learning tool which encourages students to think reflectively about their thinking process though the visual representation of the relationships between concepts (Cassata & French, 2006). By creating and modifying a concept map, students have to make decisions about the ways concepts are related to one another. Thus, concept mapping leads students to reflect on their prior knowledge since it relates to new material and engage them in a metacognitive process involving planning, monitoring and evaluating their goal attainment as the concept map is constructed.

Besides, it is also supposed that concept mapping which is manipulated in a technological platform can help to minimise the shortcomings of paper-pencil concept mapping. These shortcomings include the limitation in concept map correction or the number of concepts in the concept map, etc. (Liu et al., 2010). Moreover, computational concept mapping can facilitate the communication between students because they can attain information more

precisely by showing the screen to each other and discussing about their concept maps (Asiksoy, 2019).

Authentic learning is assumed to be a powerful learning approach which helps to engage students' prior knowledge in their learning. This study considers the authentic learning context as the relevance between students' daily life knowledge and the topics of the reading texts. According to Schema theory, all knowledge is packed into units which are called 'schema' (McVee et al., 2005). Students need to combine their own background knowledge with the information conveyed in the text to comprehend it. This implies that the relevance between students' prior knowledge and the reading text topics can effectively activate their schemata; hence facilitate their text comprehension.

From all the above assumptions, this study proposes that the use of computational concept mapping which is situated in an authentic learning context can help to foster students' metacognition and thus, facilitate their reading comprehension. Figure 2.1 presents the theoretical framework of this study.

Figure 2. 1: *The Theoretical Framework of the Research*
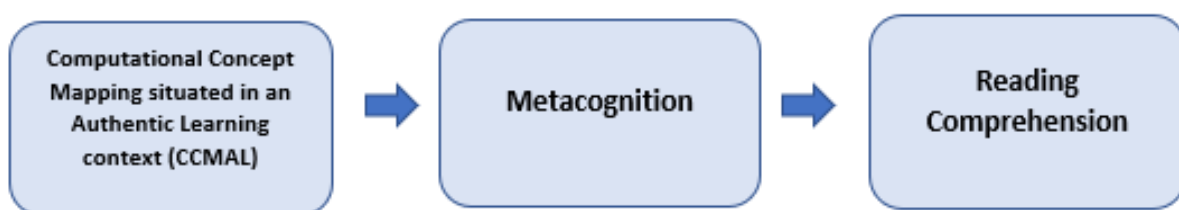
The intervention used in this study is CCMAL which combined concept mapping, technology based learning and authentic learning. It is suggested that the use of CCMAL can bring forth the advantages of each on EFL students' metacognition. Consequently, students' reading comprehension is facilitated when their metacognition is enhanced.

2.7 Chapter conclusion

The literature review undertaken in this chapter points to the potential of using CCMAL to enhance EFL students' reading comprehension skills and metacognitive strategies. Informed by this review, Chapter 3 will describe how this research study examined the influence of CCMAL on reading comprehension and metacognition in the context of EFL teaching at a Vietnamese university setting.

CHAPTER 3: METHODOLOGY

3.1 Introduction

As formulated from the literature reviewed in Chapter 2, this study is set to answer three following research questions:

1. How does CCMAL influence EFL learners' reading comprehension?

2. How does CCMAL influence EFL learners' metacognition?

3. What are the emerging factors that influence EFL learners' CCMAL learning experience?

By answering these research questions, this study aimed to examine the influence of computer-based concept mapping situated in authentic learning contexts (CCMAL) on students' reading comprehension and metacognition. This study emphasised of the influence of CCMAL on students' achievements and their use of reading comprehension skills (refer to section 4.2). This study also focused on identifying the factors influencing students' learning experiences using CCMAL in reading comprehension classes.

The inextricably relationship between students' metacognition and their reading comprehension was well described in the literature review. It is claimed that students' metacognition facilitates their reading comprehension. Therefore, this study assumed that the use of CCMAL can enhance students' metacognition thus their reading comprehension. Moreover, it is crucial to identify the possible factors that might influence students' concept mapping as this could bring helpful implications for researchers as well as educators.

This chapter presents the mixed-methods methodology that best fits the data collection and analysis of this research. It begins by framing it within the post-positivistic perspective, which accepts that a reality can be generalised for a larger population and acknowledges the possible influence of social phenomena on perceived reality. An overview of the

Convergence Mixed Methods research design of this study is then presented, followed by the procedures of data collection and data analysis. Section 3.6 presents issues related to the reliability and validity of this research. Ethical concerns for the participants' consent, privacy and confidentiality are addressed in Section 3.7. The chapter concludes with a summary of the methodology of the study and a restatement of the researcher's role in it.

3.2 Post-positivism

The data collection and analysis of this study were conducted based on the tenets of the post-positivist paradigm. Post-positivism "straddles both the positivist and interpretivist paradigms" (Grix, 2004, p. 86). According to Ryan (2018), positivists believe that one external reality does exist, and that it is discoverable through prediction, experimentation and testing of hypotheses through deductive reasoning, whereas interpretivists argue that a researcher can never be completely separate from their own values and beliefs, and these will inevitably inform the way in which data is collected, analysed and interpreted because truth and knowledge are subjective and thus culturally and historically situated in lived experiences and understandings. Post-positivism is pluralist in functioning and accepts a reality that is objective to researchers' expectations yet acknowledges the possible influence of social phenomena on perceived reality (Fox, 2008; Panhwar et al., 2017; Symonds & Gorard, 2008). For the following reasons, post-positivism is best suited to the mixed methods design of this study, which examined the possible influence of CCMAL on students' metacognition and reading comprehension.

First, CCMAL might lead to individuals having different experiences, values and perceptions of the experimental tool. Put simply, CCMAL may positively influence some students but make no difference or even negatively influence other students. A mixed methods research design underpinned by post-positivism can accommodate multiple methods for carrying out

the research according to the nature of the research questions. It also acknowledges that social factors such as students' values and experiences may influence the effectiveness of CCMAL on their metacognition and reading outcomes. Quantitative methods enabled the researcher to examine the influence of CCMAL on the participants' metacognition and reading achievements from quantifiable perspective, while qualitative methods enabled her to explain how CCMAL influences students' metacognition and reading outcomes from qualitative perspective.

Second, this research aimed to identify the factors that might influence the ways students applied CCMAL in their reading comprehension lessons. Students' experiences of the CCMAL reading course and text comprehension were constructed based on their own meaning-makings. As such, a collection of students' perceptions on what influenced their use of CCMAL in text comprehension was compiled. The basic tenet of post-positivist research is that it focuses on "researching issues in the context of involving experiences of the majority and announcing the findings of what the majority say is acceptable" (Panhwar et al., 2017, p. 253).

This research used a range of data collection instruments to investigate the influence of CCMAL on metacognition and reading comprehension from various angles. The quantitative instruments included reading comprehension tests and survey questionnaires. The qualitative instruments included interviews, classroom observations and students' artefacts (e.g., concept maps and learning journals).

3.3 The research context

As mentioned in Chapter 1, the study took place in the 2018–2019 academic year at Eastern Star University (ESU) (Pseudonym) where the researcher was then working. This regional

university is located in the North of the Central Area of Vietnam. This section describes the recruitment of the student participants and the teachers' research group, and the process of training and delivery of CCMAL.

3.3.1 The recruitment of student participants

To recruit participants to the study, Participant Information Sheet (PIS) (Appendix 12) and the Informed Consent Form (ICF) (Appendix 13) were given to students when they attended university. The ICF sought the consent from potential participants to participate in the study, and the PIS contained a summary of the study, the length of the study, and the participants' benefits and tasks. A professional translator was contracted to translate the PIS and ICF into the Vietnamese language to make sure the students clearly understood all the information conveyed in these two forms.

The PIS and ICF were placed on each chair of the lecture rooms arranged for the first-year students of the Faculty of Economics. To draw students' attention to the PIS and ICF, a note mentioning the PIS and ICF was written on the classroom board in a large font size. The PIS and ICF delivery was conducted on two consecutive days in October 2018 by the researcher and the Student Coordinator before the class time so that the presence of the Student Coordinator and the researcher, who were both not involved in the teaching, could not influence the students' decisions to participate in the project. The researcher was stationed at the Student Coordinator's office during office hours after the PIS and ICF have been delivered to collect the ICF from the students who were interested in participating in the project and to address questions related to the study such as what to bring to the reading classes or what to do if they wanted to withdraw from the course. The project advertisement (Appendix 8) was posted on the Student Information Board (SIB), which was outside the

Student Coordinator's office, to encourage greater participation. During data collection, any information related to the project was posted on the SIB.

Students returned their signed ICF to the Student Coordinator if they were interested in the study. Students were given seven days to register the reading course. The average age of the participants was 19 years.

The power size of the research was calculated by Gpower version 3.1.9.4. With the design of this study, 100 participants weighted 0.80 as the power size. Suresh and Chandrashekara (2012) posited that the ideal power for any study was considered to be 80% because with this probability, a research design has a high chance of detecting the existing difference between groups (if any) or concluding that none exists with confidence if no difference between the groups is demonstrated.

Fifty students were assigned by the purposive sampling method to the experimental group (EG) and the remaining 50 to the control group (CG). Purposive sampling is a deliberate choice of a participant due to the qualities the participant possesses (Etikan et al., 2016). The initial plan of this study was to have an equivalent number of male and female students within each group as this would help to minimise the chance of gender influencing the experimental learning tool and hence the participants' learning outcomes (Dickinson et al., 2012). However, because 21 ICFs were submitted by male students, the researcher assigned 10 of them to the EG and 11 to the CG. Table 3.1 presents the allocations of the recruited participants according to gender.

Table 3. 1**:** Genders of the Participants

Group / Gender	Experimental group	Control Group	Total
Male	10	11	21
Female	40	39	78
Total	50	50	100

Various researchers have managed to ensure consistency in the compositions of participant groups when the numbers of male and female participants enrolling the study were not equal (Hanafi et al., 2016; Kok & Canbay, 2011). In a study investigating the effects of Vocabulary Consolidation Strategy on students' vocabulary learning, Kok and Canbay (2011) assigned 12 female and 22 male students into two groups, each consisting of six female and 11 male students. Similarly, Hanafi et al.'s (2016) study of the use of a mobile augmented reality learning environment to enhance students' metacognition involved two groups of 60 students; the experimental group included 23 males and 37 females, while the control group included 22 males and 38 females.

As mentioned earlier, all the participants were first-year students of the Faculty of Economics of ESU. This faculty was among the faculties with the largest enrollment numbers at ESU in the academic year 2018–2019. The enrollment quota of the Faculty of Economics was 310 students. As well, the participants were homogeneous in terms of nationality and ethnicity, being Kinh people, which is the largest ethnic group in Vietnam.

3.3.2 The recruitment of the teacher research group

The study also involved three teachers who were currently working at ESU. Their pseudonyms are Theresa, Bianca and Helen. Theresa was invited to be the student coordinator of the project, Bianca was the teacher who would conduct the reading lessons to both groups, and Helen was the independent assessor. All three were recruited based on their previous working relationships with the researcher, their roles and duties at the university, and their experience.

Theresa mainly helped to deliver the PIS and ICF to potential student participants. She was working as the Student Coordinator of the Faculty of Economics and could access the participating students' class schedules and timetables and make the necessary arrangements for data collection.

Bianca was responsible for teaching both the EG and CG. She has a master's degree in TESOL and had 15 years' experience in teaching English at the tertiary level. She was also known as a reliable and competent teacher. She was then working at the Division of English for Non-English Majors at ESU. In addition, she was enthusiastic about this study and willing to participate by conducting the reading lessons for both groups of students.

Helen, the independent assessor, was responsible for assessing 30% of the tests on reading comprehension and the students' concept maps as an inter-rater. She also conducted inter-rater coding with 30% of each of the qualitative data sources. Helen holds a PhD in Education, and with 25 years of experience in teaching and researching in the educational field, she was familiar with using quantitative and qualitative data analysis techniques and tools.

In September 2018, the researcher made initial contact with Theresa, Bianca and Helen via emails. She then sent each an email with brief description about the project and attached the PIS version for teachers (Appendix 10) as the invitation to participate in this project. The PIS clearly explained the roles and tasks (student coordinator, teacher or independent assessor) that each was invited for, the time they would spend and the benefits they would from participating on the project. When they expressed interest in the study, the ICF version for teachers (Appendix 11) was sent to gain their official consent for participating in the project. They emailed their signed ICFs back to the researcher before she began collecting data.

A basic tenet of participant recruitment is to ensure their consent and readiness to participate in a project (Sanderson, 2010). The PIS clearly articulated the tasks that the students and the research group members would be involved in. Their specific tasks were listed in the ICF and they could select the tasks that they would like to take part in. The ICF also highlighted their right to withdraw from the project at any point during the data collection.

The privacy of the participants and research group members was also emphasised. The researcher assiduously sought to safeguard the participants' identities and the research location (Cannella & Lincoln, 2011). After recruitment, participants were asked to select pseudonyms. Furthermore, a proxy name (Eastern Star University) was chosen to refer to the university in this study. Data generated from this study are securely stored; only the researcher and her academic supervisors have the access to the raw data.

3.3.3 CCMAL training and delivery

To ensure Bianca and the participants could use Cmap tools for constructing concept maps, two training sessions were conducted separately: one training for Bianca, and the other conducted by Bianca for the 50 participants of the EG.

The CCMAL training for Bianca was in two forms: information exchanges via emails and face-to-face training. After receiving Bianca's official consent to participate in the project, the researcher discussed with her the experimental learning strategies and addressed her questions about CCMAL and Cmap. In the face-to-face training workshop conducted before the commencement of the experimental course, Bianca and the researcher discussed issues related to the experimental learning tool and collaboratively practised constructing concept maps using both standard mode and advanced functions.

Bianca conducted the 2-hour CCMAL training for the student participants after she had become confident with the Cmap tools and the learning strategies and before the data collection. This training workshop took place in the lab room where students could use the computers to construct their concept maps. Bianca introduced the concept mapping strategy and illustrated it with examples of concept maps. She instructed the students to set up Cmap software on their computers and explained the manipulations of the software, including the default mode and advanced functions. The participants then practised concept map construction with Bianca's help. She also showed them how to save and send their work to an email address that was created for data collection purposes. Finally, she answered all the questions that the participants had about concept mapping and Cmap. The researcher was present at the classroom during the participants' Cmap training session to help Bianca answer questions about it.

3.4 The Convergent mixed methodology

This study employed Convergent Mixed method research. According to Creswell and Clark (2010), mixed method design involves combining or connecting quantitative and qualitative data to provide a more complete response to a research question. It facilitates a deeper understanding of the phenomena under study, including answering how and why questions

(Maxwell & Mittapalli, 2010). Mixed methods can provide more comprehensive insights and yield a more complete picture of a student's behaviour and experience than when only a single method is used (Cohen et al., 2007).

The researcher used quantitative methods to examine the possible influence of CCMAL, which was the interventional tool used during the reading course. The students' achievements on metacognition and reading outcomes were measured through the reading comprehension tests and questionnaires as numeric data. The comparison between the quantitative results before and after the experimental course was intended to show the influence of CCMAL, while the purpose of the qualitative methods – interviews, learning journals and classroom observation – was to explain the influence of CCMAL on students' metacognition and reading ability. Additionally, the qualitative data helped identify the factors possibly influencing the ways students used CCMAL in their reading classes.

The data collection was based on the convergent paradigm. The qualitative and quantitative data were collected and analysed concurrently and then converged for comparison and interpretation. The purpose of the convergent design was to obtain different but complementary data on the same topic to best understand the research problem (Demir & Pismek, 2017). It allowed the researcher to develop a more complete understanding of the influence of CCMAL on students' reading comprehension and metacognition in the reading comprehension classes by obtaining data from both qualitative and quantitative perspectives. Moreover, the convergent mixed method design prioritised quantitative and qualitative methods equally (Creswell, 2015). The equal use of both quantitative and qualitative data sets helped to address the research problems because these two data sets supported each other. Figure 3.1 depicts the procedures of data collection and analysis of a convergent mixed method design.

Figure 3. 1: *Procedural Diagram for the Convergent Mixed Methods Design* (Adapted from Creswell, 2015)
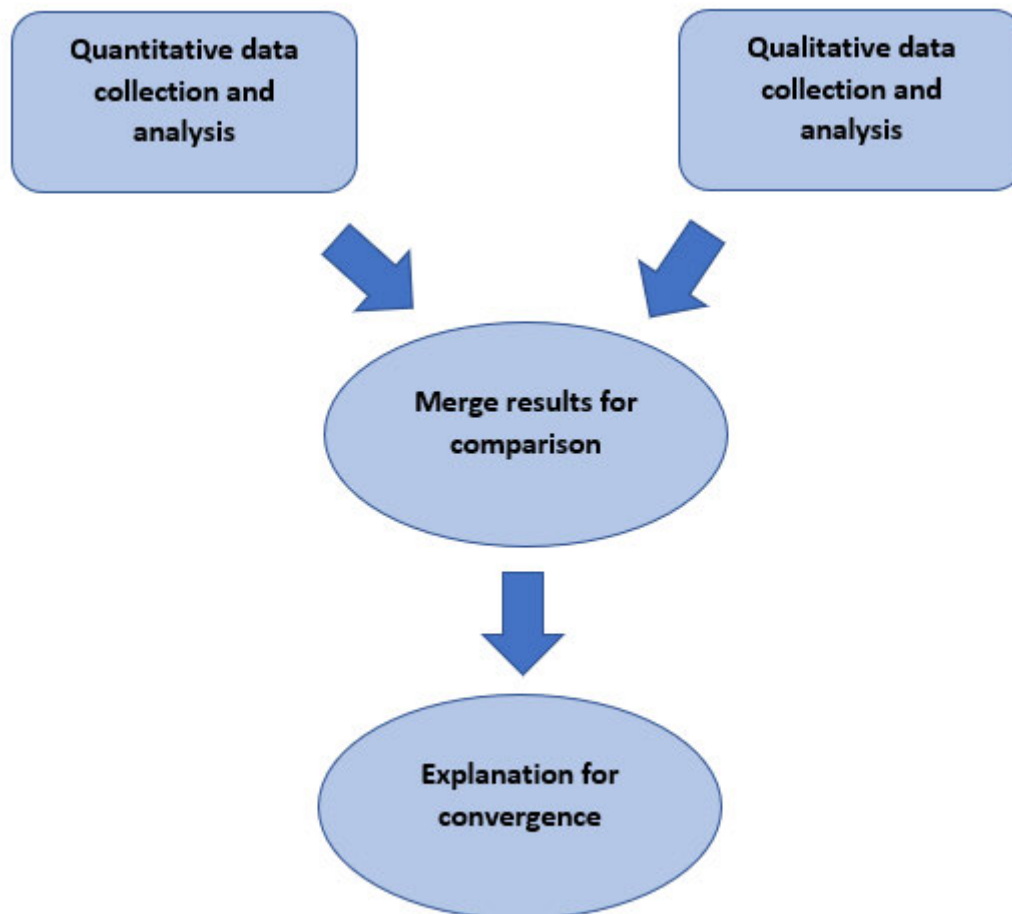
After collecting and analysing the quantitative and qualitative data in parallel, the researcher then merged these two data sets to compare the influence of CCMAL on the students' metacognition and reading outcomes across the quantitative and qualitative data. The quantitative data collected from reading comprehension tests and questionnaires helped explain whether CCMAL influenced the students' metacognition and reading achievements, while the qualitative data collected from the interviews, observations and students' artifacts provided rich descriptions and explanations for this influence.

In this study, the convergent mixed-method study was employed to answer the 'what' and the 'how' aspect of the research questions. Although the 'what' aspect was not explicitly mentioned in the research question 1 and 2, these research questions implied the quantitative aspect of data (This is discussed in more depth in chapter 7). In accordance, quantitative data were collected to answer the 'what' aspect in these research questions while qualitative were collected to contextualise the quantitative findings.

In order to answer the three research questions outlined in Chapter 1, data were collected using six instruments, as indicated in Figure 3.2. The relationships between the data collection methods the relevant research questions are also included in Figure 3.2.

Figure 3. 2: *Data Collection Methods*

DATA COLLECTION METHOD: MIXED METHOD

Quantitative Data

Qualitative Data

Reading Tests	Survey questionnaires	Concept maps	Interviews	Learning Journals	Observation

RQ 1: How does CCMAL affect EFL learners' reading comprehension?

RQ 2: How does CCMAL affect EFL letarners' metacognition?

RQ 1: How does CCMAL affect EFL learners' reading comprehension?
RQ 2: How does CCMAL affect EFL learners' metacognition?
RQ 3: What are the emerging factors that influence EFL learners' CCMAL learning experience?

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RQ 2: How does CCMAL affect EFL learners' metacognition?
RQ 3: What are the emerging factors that influence EFL learners' CCMAL learning experience?

Quantitative Data Analysis

Qualitative Data Analysis

Interpretation

Research question 1 (How does CCMAL influence EFL students' reading comprehension?) focused on the influence of CCMAL on students' reading comprehension. Reading comprehension tests were used before and after the reading course to identify whether there was any influence, and semi-structured interviews, classroom observation and students' learning journals were used to find out how CCMAL might have influenced it.

Research question 2 (How does CCMAL influence EFL students' metacognition?) focused on the influence of CCMAL on students' metacognition; hence, it was appropriate to use a survey questionnaire on metacognition, along with classroom observations, interviews and learning journals. The students' concept maps, which were constructed in weeks 1, 4 and 7 of the reading course, also provided information related to research question 2.

Individual interviews, students' learning journals, and classroom observations were also used in response to the aim of research question 3 (What are the possible factors influencing EFL students' concept mapping in reading comprehension classes?) to identify the possible factors that might influence students' CCMAL learning experiences in their reading comprehension class.

3.4.1 Quantitative data collection methods

3.4.1.1 Reading comprehension tests

In this study, two printed reading comprehension tests with identical formats were used to measure the reading ability of the participants of both groups before (pre-test) and after (post-test) the reading course. The participants in both groups were given the same reading comprehension tests to examine their skills in scanning (test items 1, 2, 3, 8), skimming (test item 7), predicting words (test items 4, 9), connecting ideas (test item test items 6, 10, 12), and making inferences (test items 5, 11).

Because the texts of the reading course were taken from the current official textbook for English non-majored students at ESU, the reading comprehension pre-tests were selected from ESU's central question bank, which was designed by the experts of the university and had been used for a long time. Each test consisted of two reading passages, each containing approximately 250 to 300 words. There were six questions (four multiple choice and two open-ended) for each reading passage.

The 12 test items of the reading tests included eight multiple choice questions and four open-ended questions. There were two reading passages in each test, and six test items (four multiple choice and two open-ended questions) were designed for each reading passage. The pre- and post-tests on reading comprehension were designed to assess the students' use of a range of reading comprehension skills: scanning (test items 1, 2, 3, 8), skimming (test item 7), predicting words (test items 4, 9), connecting ideas (test item test items 6, 10, 12), and making inferences (test items 5, 11).

The topics of the reading passages were "Caves" and "Sisters", which were closely related to the reading topics of week 1 ("Family") and week 6 ("Traveling") of the reading course. In the post-test, the order of the items was reshuffled, and the questions were modified to avoid students' memorising them. Table 3.2 is an example of how the test items were modified.

Table 3. 2: Sample Illustration for Test Item Modification

Pre-test	Post-test
What destroyed the painting in the cave? a. Water and temperature change b. Birds and horses c. Entrances d. Bison or wild cats	What caused the destruction of the painting in the cave? a. People b. Horses and Birds c. Water and the change of temperature d. Wild cats and Bison

The pre- and post-tests were reviewed by a staff member of ESU's Department of Examining and Training Quality before being administered. To ensure that the content of the tests was relevant to the reading lessons, the researcher also consulted Bianca, who conducted the reading course to both groups.

While the tests were being administered, students were asked to sit with sufficient distance between each other to avoid discussing or copying. The allowed time for completing the reading tests was 30 minutes. However, students could submit their answers earlier if they finished their tests sooner. They were to place their answer sheets in a box that was left in the corner of the classroom. Submitting the test answers was not obligatory. However, the importance of the data collected from the students to the findings of this study, as well as the benefits of this study to improving the EFL teaching and learning in Vietnam, were clearly articulated to the students in the PIS. Consequently, all the students sitting for the tests were willing to put their answers in the box.

The assessments were prepared based on the assessment guide for Reading Comprehension introduced by the Department of Examining and Training Quality of the university. The test assessments were based on a point scale of 1 to 12; that is, each correct answer was counted as one of the 12 points. The answers for the multiple-choice questions were fixed. However, the open-ended questions accepted variations; alternative answers that were discussed by the researcher and Helen, the independent assessor, were provided in the marking guide (Appendix 14).

The researcher also consulted a staff member of the university's Department of Examining and Training Quality about the test assessment guide. Accordingly, a general description of the reading course, as well as the texts selected for the reading course, were attached with the assessment guide for their expert evaluation.

3.4.1.2 Survey questionnaires

Two printed survey questionnaires were used in this study. A survey questionnaire on general self-efficacy (GSE) was used to examine each student's belief about their general self-efficacy, and a questionnaire on metacognition was used to collect information related to their metacognition. The students took approximately 10 minutes to complete the questionnaires on general self-efficacy and 20 minutes to complete the survey questionnaires on metacognition.

In social science research, the questionnaire is a useful, quick and affordable technique for collecting information from a large number of participants, for helping the researcher maintain the confidentiality of the participants, and for corroborating findings from other information collection resources such as interviews and observations (Akbayrak, 2000; Creswell, 2003). In this study, the questionnaire on general self-efficacy was administered prior to the study, and the questionnaires to assess the participants' metacognition were administered before and after the reading course.

Survey questionnaires on metacognition

The questionnaires on metacognition also included a demographic section that asked for students' ages, genders, ethnicities and nationalities. This was to make sure that the recruited participants met the criteria of the study: they were between 18 and 20 years of age, Vietnamese nationals, and Kinh people. Additional information about participants' genders helped the researcher ensure that both groups had consistent gender compositions.

The items on metacognition were adapted from the Metacognitive Reading Questionnaires (MRQ) developed by Phakiti (2003), which aimed to investigate students' metacognition in reading comprehension classes. In this study, there were 13 items covering three components

of metacognition: Planning (4 items), Monitoring (5 items) and Evaluating (4 items) (Appendix 2).

The MRQ has been used as the measuring instrument of students' use of metacognitive reading strategies in a number of studies (Phakiti, 2003, 2006). Phakiti's (2016) study of EFL students' use of metacognitive strategies in their reading comprehension classes showed that the Cronbach alpha values of Planning, Monitoring and Evaluation were .71, .71, and .68, respectively. According to George and Mallery's (2003) classification of reliability ranges of data collection methods, these values indicated acceptable rates of reliability. In the survey questionnaires on metacognition, the words "task", "activity" or "course" were replaced by "CCMAL" or "concept mapping" for students in the experimental group. Figure 3.3 shows a sample item from the survey questionnaires on metacognition.

Figure 3. 3: *A Sample Item of the survey questionnaires on metacognition*

The survey on metacognition was used both before and after the experimental reading course. However, the order of the items of the post-survey questionnaire was re-shuffled to avoid the learners' recalling the pre-survey questionnaires. Participants of the EG who were interested in participating in the one-to-one interviews that were conducted at the end of the reading course

could leave their contact details after the post-survey questionnaires on metacognition. The researcher then contacted these participants to arrange times and places for their interviews.

Questionnaires on General self-efficacy

The other questionnaire used in this study was the questionnaire on general self-efficacy. The general self-efficacy scale (GSE) was introduced by Schwarzer and Jerusalem (1995) (Appendix 3), with general self-efficacy referring to students' beliefs about themselves when solving the problems or reaching their goals in general. In this study, the GSE was administered before the reading course to establish the fact that there were no significant differences between the two groups of students. In studies conducted by Betoret et al. (2017) and Yokoyama (2018), the GSE was adopted to examine the level of general self-efficacy of students before the study (Betoret et al., 2017; Yokoyama, 2018) to ensure that the differences in students' general self-efficacy was not a confounding factor to the influence of the intervention on students' academic achievements. Rowbotham and Schmitz (2013), in their study related to students' self-efficacy, found that the Cronbach Alpha values of the GSE scale items ranged from .75 to .91, implying that the reliability of the GSE was acceptable to excellent (George & Mallery, 2003).

In this study, the purpose of the survey questionnaire general self-efficacy was to examine and compare the self-efficacy of the participants of the EG and the CG before the reading course. The estimated time for completing the GSE was approximately 10 minutes. The GSE items were rated based on the 1 to 4 scale. There were 10 items in the GSE scale, and the total score was calculated by finding the sum of all items. Figure 3.4 shows a sample item from the GSE scale.

Figure 3. 4: *A Sample Item of the GSE Scale*

```
I can always manage to solve difficult problems if I try hard enough

        1                  2                    3                    4

  Not at all true      Hardly true       Moderately true       Exactly true
```

3.4.1.3 Concept maps

The concept mapping procedures adopted in this study were originally developed by Pannen (2001), whose concept mapping model includes three steps: (a) the teacher uses a focus question to ask students to find out the topical concept for the map; (b) students try to identify the important concepts from the text that would be used for the concept map: and (c) students complete the concept maps by identifying the relationships between the concepts, and arrange the concept as well as the relationships between them on the maps.

In this research, only the EG was exposed to CCMAL; hence, concept maps were collected from only these participants. In each lesson, students were allowed 20 to 30 minutes to construct a concept map based on a reading text. When their concept maps were completed, the students were encouraged to email their concept maps to the researcher. Although the students were asked to construct a concept map in every lesson of the reading course, their concept maps were collected at the beginning, midway and end of the reading course: week 1 (CM1 – 24 maps), week 4 (CM2 – 24 maps) and week 7 (CM3 – 23 maps). Comparing the concept maps collected at these three time points helped the researcher identify the possible progression in students' concept mapping skills during and after the course. Figure 3.5 is a sample concept map collected from a participant in week 4.

Figure 3. 5: *A Sample Concept Map of a Participant* (Phuong Nguyet – Week 4)
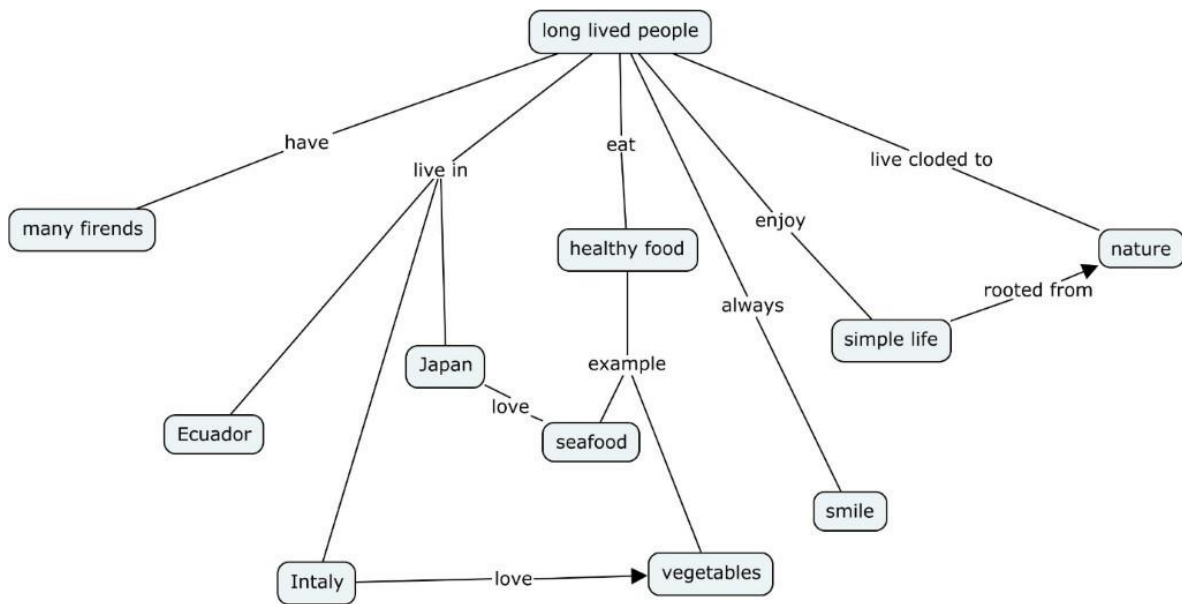
The students' concept maps were assessed based on the rubrics for assessing concept maps prepared by the University of Minnesota Digital Media Center (UMCMA, 2004).Following is the rubric for assessing concept maps prepare by UMCMA.

Table 3. 3: The Concept Map Assessment Rubrics by UMCMA, 2004.

Criteria	Excellent	Good	Adequate	Marginal	No Credit: is unacceptable to review
Structure	Non-linear structure that provides a very complete picture of your ideas	Non-linear structure that provides a complete picture of your ideas	Non-linear structure that provides a picture of your ideas	Non-linear structure that shows some relationships between ideas	Inappropriate structure
Relationship	Relative importance of ideas is indicated and both simple and complex relationships are very effectively mapped	Relative importance of ideas is indicated, and relationships are very effectively mapped	Relative importance of ideas is indicated, and relationships mapped	Importance is evidence but not very distinctive: relations are somewhat clear but lacking	No differentiation between ideas: no evidence of meaningful relationships
Exploratory	Map shows complex thinking about the	Map shows effective thinking about	Map shows definite thinking about	Map shows some thinking about	Thinking process is not clear

	meaningful relationship between ideas, themes, and the framework	the meaningful relationship between ideas, themes, and the	the relationship between ideas, themes, and the	relationships between ideas, themes, and the framework	
Communication	Information is presented clearly and allows for a high level of understanding	Information is presented clearly and allows for a good level of understanding	Information is presented clearly and allows for a basic level of understanding	Information is presented and some understanding can be gained	Information is not clear, very difficult to understand

These evaluation criteria were used because they include not only the form and content of the concept map, but also the interactive relationship between the concept mappers and their works (Smythe, 2010). The UMCMA (2004) concept map assessment has four criteria: the map's structure, the relationships between concepts, the exploratory of the map, and the communication of the map. The five levels to evaluate in each criterion correspond with the points of each level: excellent (5 points), good (4 points), adequate (3 points), marginal (2 points), below credit (1 point). The overall points scored for the concept maps are the total sum of the points of the four criteria.

The students' concept maps were used as both quantitative and qualitative data sets. As a qualitative source of data, concept maps were analysed by the researcher focusing on the concepts used in the concept maps and the propositions in the concept maps. The researcher also investigated the use of alternatives of the textual concepts (e.g., pictures, videos, etc.) and the interlinks between concepts. Other characteristics of the concept maps were also taken into consideration were the text fonts and sizes, the arrangement of the concept maps, the design of the links, etc. At the beginning of the process, the researcher and the interrater independently analysed thirty percent of the concept maps collected. The researcher compared the analysis collected from the interrater and the researcher's data for any differences. The researcher also had a discussion with the interrater to deliberate the variation.

As already mentioned, students' concept maps were collected, scored and compared at three time points to examine the possible progression in their concept mapping skills. In addition, the concept maps provided in-depth explanations for the influence of CCMAL on the students' metacognition and reading comprehension.

3.4.2 Qualitative data collection methods

3.4.2.1 Semi-structured interviews

In this research, interviews were used to reveal in-depth information about the implementation of CCMAL in the reading comprehension class that might not have been easily obtained from other forms of data collection (Kabir, 2016). For instance, the learning journals might have revealed the possible factors that had influenced the students' use of CCMAL, but without purposive probing, journaling could not be relied on to explain why and how those factors would influence the students' use of the experimental tool.

The interview protocol's clear set of instructions guided the researcher to focus the conversations on the research aims and objectives. These protocols were based on Newcomer et al.'s (2015) guide for designing semi-structured interviews; they contained open-ended and closed questions that were accompanied by follow-up "why" or "how" questions to delve further into the interviewees' unseen stories. The open-ended questions helped the researcher uncover more information about the possible factors that might have influenced the students' use of CCMAL.

Semi-structured, one-on-one interviews allow interviewees to focus on each specific question that the researcher poses (Gaskell, 2000). Moreover, they are ideal when looking for detailed information on topics that people are unlikely to openly talk about in front of others or when testing concepts that may be difficult to understand and that participants may not want to demonstrate ignorance of in a public setting (Palmerino, 2006).

Researchers have recommended that interviews be conducted with around 12 participants in a homogenous group to avoid saturation (Baker & Edwards, 2012; Guest et al., 2006; Latham, 2014; Saunders et al., 2018). Saturation is commonly taken to indicate that, on the basis of the data that have already been collected or analysed, further data collection and/or analysis would be unnecessary.

In this study, 12 participants were selected for the interviews. As mentioned earlier, Bianca notified students about the interviews that would be conducted after the reading course and that students who were interested in participating in them should leave their contact details. Their names were written on pieces of paper and randomly picked until 12 names were selected. In the week after the experimental reading course finished, these 12 participants were contacted to discuss times for the interviews. The researcher created an interview schedule in the form of a spreadsheet on Google docs and emailed the link to the students, who then booked convenient interview times by inserting their names into a time slot. The researcher then emailed each student to confirm their appointment. All the interviews took place in the Student Coordinator's office. To avoid any possible distraction, only the interviewer and the interviewee were present.

Each interview was conducted within a 20-minute timeframe and audio-recorded with participants' permissions. All the interviewees were asked to respond to the same questions included in the interview protocols (Appendix 5), which were based on the interview protocol crafting guides developed by Rabionet (2011). The interviews started with an introduction that included the statements of confidentiality, consent, options to withdraw, and use and scope of the results, followed by questions on the participants' backgrounds. The next part contained questions related to the students' perceptions on CCMAL and sets of open-ended and closed questions. The open-ended questions allowed for extended probing for in-depth explanations,

while the closed questions, which were accompanied by follow up "why", "what" and "how" questions provided further understanding of the students' perceptions of CCMAL (Newcomer et al., 2015; Rabionet, 2011). After each question, the researcher summarised the student's response and sought his/ her confirmation. In case the student disagreed with the summary, the researcher asked the student for more clarification.

To ensure that the students would understand the interview questions and articulate their ideas clearly, the interviews were conducted in Vietnamese. The interview records were then transcribed by the researcher in a denaturalised method that accurately described the discourse but removed data characteristics such as the description of accent or involuntary sounds. The denaturalised transcriptions were therefore both coherent and easy to read (Mero-Jaffe, 2011). These transcripts were then translated into English for coding purposes. The translation was also conducted by the researcher, followed by back-translation by a professional translator to ensure the accuracy of information conveyed in the translated interviews. The researcher compared the original Vietnamese transcripts with the back-translated versions to diagnose any misinterpretations due to socio-cultural or linguistic factors. No significant differences were found between the two Vietnamese versions of the interviews, thus indicating the relative accuracy of the English translation.

3.4.2.2 Classroom observations

According to Hora and Ferrare (2013), classroom observation is a method of directly observing teaching practice as it unfolds in real time, with the observer or analyst taking notes and/or coding instructional behaviors seen in the classroom. It can provide rich and detailed accounts of classroom practices and of students' behaviours and non-verbal communications that cannot be captured by other techniques. In this study, classroom observations allowed the researcher to observe the students' experiences with CCMAL during the reading comprehension course.

Overt observations were conducted to avoid ethical issues related to participants' consent. However, the limitations of overt observations, such as altering students' behaviours (Ferguson, 2018), were taken into consideration in the design of the study. The researcher had built rapport with the students during the participant recruitment period by being present at the Student Coordinator's office to address their questions and by attending the Cmap training session as a facilitator.

During the classroom observations, the researcher witnessed the classroom practices as an "empathetic observer", which Blaikie (2007, p. 10) has suggested is an effective and ethical approach to observation as it can assist data collection from the perspectives of both the researcher and the learners. This allowed the researcher to occasionally participate in classroom activities (e.g., constructing a concept map) and gain more richly contextualised information. However, she focused on collecting data rather than participating in the activities being observed, maintaining as much respect to the natural settings as possible by avoiding any interactions with participants that might influence their learning.

In Vietnam, due to the influence of Confucianism, teachers have a powerful status in the class and the teacher-learner relationship is considered a senior-junior relationship (Canh, 2001). In accordance, the presence of the researcher might influence students' behaviours. Acknowledging the possible power distance in a Vietnamese classroom, the researcher sat in the corner of the classroom and managed to avoid interactions with students to ensure that the data collection procedure was conducted in the most objective way.

Classroom observations were conducted for every lesson of both groups. In total, 14 observations were conducted during the course. The observation fieldnotes for both groups were in the same format (Appendix 7) and based on the unstructured framework for qualitative field notes developed by Kington et al. (2018), which focuses on describing tasks, activities,

student engagement, and classroom practices. According to Lindorff and Sammons (2018), a major benefit of unstructured fieldnotes is their potential to provide a greater degree of specificity regarding particular features of classroom practices. Figure 3.6 is an example of observation fieldnotes.

Figure 3. 6: *Sample Classroom Observation Field Note* (EG, Week 7)

> **How do students engage in classroom activities?**
> *It was observed that none of the students used dictionaries for looking up the unknown words. Instead, they tried to guess the meaning of those words. Many of them were observed to be talking to their peers about guessing the words by connecting the other words in the text. Some students sitting next to me were observed to try to arrange the concepts on the concept maps and infer the meaning of the unknown concepts based on the propositions. These students were observed to be quick in making connections of ideas using concept maps. Some of them even did this without much hesitation. These students seem confident with their concept map construction.*

The observation field notes combined both descriptive and reflective observations. Descriptive field notes are the "tangible, physical, objective interpretation of what was going on during the observation period", while reflective field notes offer "critical insights, inferences about the speculation as to what is taking place and why" (Allen, 2017, p. 565). The use of both perspectives helped the researcher not only describe the classroom practice but also reflect priori judgements about instruction and pedagogical instruments (Kawulich, 2005). The descriptions of the students' classroom engagement, their attitudes toward using CCMAL in the reading class, and detailed accounts of their concept map construction were recorded in the fieldnotes. Comments on specific classroom practices were also given when necessary.

3.4.2.3 Learning journals

Learning journaling is a type of self-administered questionnaire often used to record frequent or contemporaneous events or experiences. In the context of this research, journaling was

crucial for collecting valuable data because it allowed students to provide information from their own worldviews honestly and objectively without feeling inhibited by the presence of the researcher. Learning journaling supplemented interviewing for the collecting of information related to how CCMAL influenced participants' reading comprehension and metacognition. Learning journals also helped the researcher identify the possible factors that might influence students' use of CCMAL in the studying of reading comprehension (see Appendix 4).

Journaling can also be a reliable alternative to the traditional interview for events that are difficult to recall accurately or that are easily forgotten (Kabir, 2016). In this study, the learning diaries kept by students throughout the reading course allowed them to note their learning experiences as they used CCMAL in text comprehension and decreased the likelihood of them missing important information. The students in both groups were provided with a booklet containing seven learning journals corresponding to the seven weekly sessions of the reading course. The learning journal design was based on Kabir's (2016) guidelines for open format journaling in order to allow more opportunities to recode and analyse the data. Each learning journal contained four guiding questions with spaces after each question in which the students could write their answers. The guiding questions aim to obtain students' reflection about their learning experience. The first question required students to narrate their reading comprehension process. The second question asked students about the reading comprehension skills they have learned during the lesson. The third questions looked into the difficulties that students encountered during the lesson and the fourth one asked about students' comments on the lesson. For the last question, students could provide their opinions about the software, the reading process, or concept mapping. Each question allowed students the word limits of two hundred words and students can write their answers in Vietnamese. The structure and content of the guiding questions, the researcher consulted with a staff member of the site university's Research Unit who had rich experience in research activities.

Although the learning journals that were used for the seven weeks of the reading course contained the same guiding questions, participants were likely to answer them differently from week to week due to the changes in their perceptions of CCMAL. During the course, Bianca clarified to the students that whatever they wrote in the learning journals would not influence their academic results and that their confidentiality was assured. This was to encourage them to present their ideas about CCMAL honestly and openly in their learning journals. Figure 3.7 is an example for learning journal guiding questions.

Figure 3. 7: *A Sample Learning Journal with Translation* (Phuong Nguyet – EG – Week 1)

Describe your learning process when creating CCM or learning in class

Em sử dụng Google dịch để biết nghĩa của các từ em không biết và nắm sơ qua ý nghĩa cả bài đọc. Sau đó em tìm các từ mới trong bài và vẽ bản đồ khái niệm dựa trên các từ khảo đó. Sau khi vẽ xong bản đồ, em so sánh với ý nội dung bài khóa lúc ban đầu để hiểu bài khóa sâu hơn.

(I use Google translation to know the meaning of the unknown words and the general content of the text. After that, I find out the key words and draw the map. After the map is finished, I compared it with the general meaning I assume at first to understand the text more deeply.)

The learning journals for the CG had the same structure as those for the EG. However, words in the EG group's journals indicating the experimental tool, such as "CCMAL" or "concept mapping activities", were replaced by "the reading course" or the "reading comprehension activities" in the learning journals prepared for the CG.

Learning journal submission was optional to students; however, during the reading course Bianca encouraged them to submit their learning journals. At the end of the study, she asked the students to put their journals into a box that was left outside Theresa's office for a week after the completion of the reading course. This information was also posted on the Student Information Board so that they knew the deadline for submitting their journals.

3.4.3 Data collection procedures

This section describes how the study began and how it was implemented. In this study, the data collection process involved three phases: before, during, and after the experimental reading course. Figure 3.8 outlines the data collection procedure.

Figure 3. 8: *Data Collection Procedure*

DATA COLLECTION PROCEDURES							
Data collection methods Timeframe	Reading comprehension tests	Questionnaires on Motivation and Metacognition	GSE Scale	Students' Concept Maps	Semi-structured Interviews	Learning Journals	Classroom Observation
Before the Reading Course	Pre-test on Reading Comprehension	Pre-test questionnaires on Motivation and Metacognition	GSE Scale				
During the reading course — Week 1				CM1		Learning Journals 1	Classroom Observation 1
Week 2						Learning Journals 2	Classroom Observation 2
Week 3						Learning Journals 3	Classroom Observation 3
Week 4				CM2		Learning Journals 4	Classroom Observation 4
Week 5						Learning Journals 5	Classroom Observation 5
Week 6						Learning Journals 6	Classroom Observation 6
Week 7				CM3		Learning Journals 7	Classroom Observation 7
After the Reading Course	Post-test on Reading Comprehension	Post-test Questionnaires on Motivation and Metacognition			Interviews		

3.4.3.1 Before the reading course

Prior to the reading course, the participants of both groups were asked to take a reading comprehension test. This test took approximately 30 minutes to complete, and students could put their answers into a box that was left in the corner of the classroom. While this test was administered, students were asked to sit at a distance from each other to avoid copying or discussing it with their friends. They were also required to complete a questionnaire survey that

asked about their metacognitive strategies for learning reading comprehension. This survey it took approximately 20 minutes to complete, and they put their answers into the same box in the classroom corner. Afterwards, they were asked to complete the Schwazer and Jeruzalem's (1995) General Self-Efficacy Scale (GSE). This took them about 10 minutes to complete and their replies were again put in the box.

Information about the time and place for data collection was posted on the Student Information Board, which was outside Theresa's office, and at the main entrance of the Faculty of Economics building. The researcher asked the university for permission to have the lecture room open on a weekend for data collection to avoid conflicts with the students' learning schedules. However, because there was only one lecture room available for the project on that day, the EG students were asked to come in the morning and the CG students in the afternoon. While the students completed the reading comprehension test and survey questionnaires, the researcher was outside the classroom to avoid any possible influence on their performance.

3.4.3.2 During the reading course

During the reading course, one session of two hours was scheduled every week for each group. The reading course was seven weeks long. According to Marek (2019), an intervention should be at least about seven weeks long as short interventions cannot count for the novelty effect because the increases in performance might be temporary. In this context, a seven-week reading course was considered to be suitable for first year students' schedule. At ESU, semester 1 for first year students started in September and finished in December. The reading course was conducted during October and November. It ended in the first week of September 2018. It was important that the course ended before students' examination because during the examination period, there could be absence or distraction of students from the reading course and this might negatively influence the quality of collected data.

The EG was exposed to CCMAL activities while the CG had traditional instruction. The following figure depicts the differences between the treatments of the experimental group and the control group.

Figure 3. 9: *The Differences between the Treatments of EG and CG*

	Learning method	Learning approach	Research Methods					
			Reading comprehesion test	Questionnaires	Concept maps	Learning Journals	Observation	Interview
Experimental group	CCMAL	Student-centred	✓	✓	✓	✓	✓	✓
Control group	Traditional method	Teacher-centred	✓	✓	✗	✓	✓	✗

While students of CG followed the syllabus during the reading course, students of EG utilised concept mapping as learning activities. This might lead to the risk of disadvantaging students of CG as they did not have exposure of CCMAL during the reading course. To solve this problem, another reading course which involved concept mapping activities was organised for students of CG after the data collection process completed. The procedure of oganising the compensation course for CG is presented in detail in chapter 7.

In each class session, the students of EG were allowed 20 to 30 minutes to construct a concept map as a pre-reading activity. The activities selected for this project were the "construct-the-map" tasks that would reflect the differences in students' knowledge structures accurately and thus supply students with more opportunities to reveal their conceptual understanding (Novak & Canas, 2007).

At the beginning of the lesson, the students were asked to read the text and construct a concept map based on the key concepts that they could find out in it. They were able to extend the concept map by adding concepts that were not included in the reading text if these made the maps seem more logical. In total, each student constructed seven concept maps during the

reading course. However, only the concept maps constructed in weeks 1, 4 and 7 of the reading course were selected. Although map submission was not obligatory, they were encouraged to share their concept maps. The topics of the selected text were "Family", "English", "Music", "Long lives", "Haunted houses", "Traveling", and "Food". These reading texts were taken from the book *English File Elementary* (Latham-Koenig et al., 2012), which was then used as the only official textbook for English 1 classes for non-English majors at the site university.

Learning journals were collected from both groups of participants in the form of a booklet containing seven learning journals corresponding to the seven weeks of the reading course. Students were encouraged to write a learning journal each week. They could write their answers to the guiding questions on the learning journals at home or at the classroom at their convenience. The learning journal submission was open for one week after the reading course finished, and students could leave their journals in a box outside Theresa's office.

Classroom observations were conducted during every session of both groups. There were two classroom observations a week: one each of the EG and of the CG. The researcher was present at the classroom and silently observed the classroom practice. She sometimes participated in the classroom activities; however, she tried not to make any interactions that might influence the students' learning.

3.4.3.3 After the Reading course

The post-test on reading comprehension and post-survey questionnaires on metacognition were administered in the same manner as the pre-test ones. The post-test on reading comprehension took approximately 30 minutes to complete and the post-survey questionnaires on metacognition took approximately 20 minutes to complete. A box was placed in the corner of the classroom for collecting the students' reading answers. Data were collected through the post-test on reading comprehension, the post-test questionnaires on metacognition, and the

semi-structured interviews. The learning journal booklets were also collected after Bianca notified the students about why, when, and where they were to submit them. This information was also mentioned on the Student Information Board. A box was placed outside Theresa's office for one week after the course finished so that students could submit the learning journals at a convenient time.

At the end of the reading course, the researcher emailed the participants who had left their contacts at the end of the survey questionnaires to arrange times for their interviews. The interviews were implemented in a semi-structured method that allowed the conversation to flow when it dealt with the core issues of the research and at the same time avoid straying from the topic (Alajmi, 2011). All the interviews took place at Theresa's office. In order to encourage shy interviewees to share their insights, the researcher tried to create a comfortable atmosphere by conducting the interviews in the form of the conversation with some guiding questions.

3.5 Data analysis

This section summarises the analysis of the quantitative and qualitative data of this research.

3.5.1 Inferential statistics and Data analysis

Quantitative data were analysed using SPSS (Statistical Package for Social Sciences) version 20.0. The Centre for Research in Mathematics at Western Sydney University was consulted to guide and assist the researcher in executing the SPSS Software.

The inferential statistics for the participants' demographics were tabulated. Students' scores on reading tests, concept maps and survey questionnaires were also summarised in tables and graphs. Independent samples t-test and paired-samples t-test were used for examining the influence of CCMAL on students' reading outcomes and metacognition. An independent

samples t-test was used to identify if there was any significant difference in reading comprehension and metacognition between two groups before the reading course, while a paired-samples t-test was used to find out whether there were any changes in students' reading outcomes and metacognition after the reading course.

The Pearson correlation coefficients between the participants' scores on reading and their scores on concept maps were calculated to identify the correlative relationship between them. The correlations between reading outcomes and metacognition were similarly calculated. Specifically, the correlations between concept mapping scores and metacognitive components (planning, monitoring and evaluation) were calculated to identify the influence of concept mapping on each component of metacognition. This was to determine whether CCMAL influenced students' reading comprehension through their use of metacognitive strategies.

The regression modelling technique was also used. This technique is useful for modelling the strength and direction of the relationship between one or more independent variables and a dependent variable (Tabachnick & Fidell, 2007). Linear regression modelling helped to determine the influence of CCMAL on students' reading comprehension and metacognition through the R-square coefficients.

3.5.2 Reflexive Thematic Analysis

Thematic analysis can be developed via two main approaches: reflexive thematic analysis (Braun & Clarke, 2006, 2012; Braun & Clarke, 2013) and coding reliability thematic analysis (Boyatzis, 1998; Linneberg & Korsgaard, 2019). This study used Braun and Clark's (2006) reflexive model for two reasons. First, this model provides detailed guidelines for analysing qualitative data; it includes six steps, with the instructions for each step clearly articulated (Figure 3.9). By using such a detailed guiding scheme, the researcher consciously and

deliberately refined the themes to fit with the research questions, thereby increasing the intellectual rigour of the study.

Figure 3. 10: *Procedure for Thematic Analysis* (Adapted from Braun & Clarke, 2006)
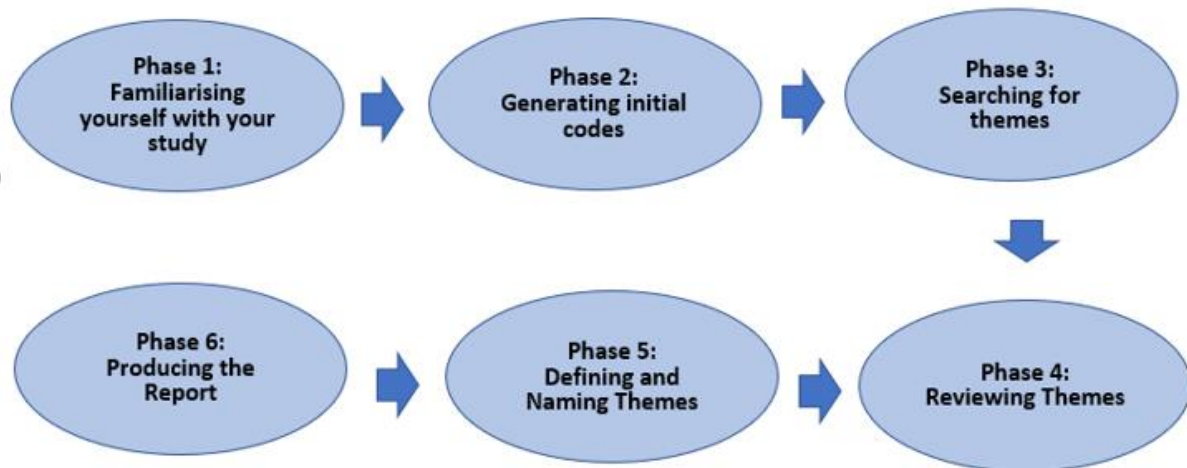
Second, in this model, coding can be considered as both analytic inputs and outputs. This view stands somewhere between reliability coding, which conceptualises coding as analytic inputs only, and grounded theory, which conceptualises coding as an inductive process (Braun & Clarke, 2019). In this study, some assumptions about the themes were made early in the analytic process in the form of the quick notes, while defined themes were developed after the coding process.

3.5.2.1 Implementation of Reflexive Thematic Analysis

In the first phase, the researcher familiarised herself with the data by conducting a back-translation and revisiting the interviews and the learning journals. After reading through the qualitative data corpus and reflecting on the research questions, she made notes and jotted down early impressions. Following is an example of the notes generated in phase 1.

> *It seems that students think that CCMAL is useful for them in learning English. They think that CCMAL is interesting. They believe that CCMAL has various benefits for their reading*

comprehension. However, they also realise a number of difficulties in using CCMAL in reading classes.

In phase 2, line-by-line open coding was used to generate initial information from the qualitative data. Although some assumptions were made before coding, the coding procedure was conducted based on the guidelines of grounded theory coding in order to avoid missing important and interesting information, which might have been caused by a theoretical thematic-driven analysis. Charmaz (2006) has described the coding process as the inclusion of initial coding and focused coding:

> Grounded theory coding consists of at least two phases: initial and focused coding. During initial coding we study fragments of data – words, lines, segments, and incidents – closely for their analytic import. From time to time, we may adopt our participants' telling terms as in vivo codes. While engaging in focused coding, we select what seem to be the most useful initial codes and test them against extensive data. (p. 46)

In this stage, the meanings of long, transcribed statements were reduced to a few simple categories and condensed into briefer statements to be prepared for interpretation. Afterwards, conceptual meaningful categories were generated from these segments. Theoretical coding was conducted to relate similar codes with each other. The focus was on the general meaning of responses rather than the words of the interviewees. For example, "Real-world knowledge helps to understand the texts better", "Real-world knowledge helps to understand the texts more clearly", and "Real-world knowledge helps to understand the text content" were all categorised under "Real-world knowledge assisting text comprehension".

In the focused coding, the codes were categorised in ways that represented the main thematic areas of the research. They included the main areas that had already been found from the literature; information related to the benefits as well as shortcomings of the CCMAL reading

course that were repeatedly reported by the informants; and factors influencing how the students used CCMAL in the reading comprehension class.

In every step of the coding process, audit logs were created to record the changes made during coding procedures. According to Carcary (2009), the use of the audit trails in qualitative research helps to enhance the trustworthiness of the findings because they allow readers to trace through a researcher's logic and provide explanations for her decision making. The following is an excerpt from one of the researcher's audit logs for the initial coding step:

> *At first, my coding was strictly based on line-by-line division. That is, I read through the lines to search for the key concept(s) of each line. However, many lines contained incomplete ideas because they were a part of a full proposition. Thus, I decided to divide the lines more flexibly by allowing a full segment when it was necessary.*

In phase 3 of qualitative analysis, all the categories that emerged from the focused coding step were reviewed to build themes. Similar categories were again grouped into a theme. For instance, "Developing reading comprehension skills", "Enriching knowledge", "Broadening vocabulary", and "Assisting text comprehension" were categorised under "Benefits of CCMAL".

In phase 4, the themes built from the categories were reviewed to ensure systematicity and equivalence with the research questions. After the themes were carefully reviewed, the coding report was exported as a part of the findings of this study.

3.6 Reliability and Validity considerations

Reliability and validity are two of the most important features in the evaluation of any research measurement instrument (Mohajan, 2017). This section presents the strategies used to ensure that the research has met the highest methodological standards and that its results are robust.

3.6.1 Reliability

Reliability has been defined as the consistency of measurements (Heale & Twycross, 2015). To ensure the reliability of the measurements in this study, the researcher used techniques such as Cronbach's Alpha coefficient, the "split-half" technique, and inter-rater reliability.

Cronbach Alpha reliability was used for ensuring the internal consistency of the reading tests. Cronbach's alpha is a measure of internal consistency within the instrument and reflects how well a set of items measures a particular behaviour or characteristic within the test (Drost, 2011). Thus, the Cronbach's Alpha coefficient indicates the correlation among the test items. In this study, the Cronbach's Alpha coefficient for 12 test items (N = 100) was .812, suggesting that the test items have relatively high internal consistency.

The "split-half" technique was incorporated to make sure that the reading comprehension tests were reliable for measuring the students' reading comprehension. This technique is especially useful for novice researchers because of its simplicity and practicality (Drost, 2011). In this technique, all items in the reading comprehension tests were divided randomly into two sets (group 1 and group 2). The Cronbach's Alpha of the test item groups was used as the indicator of the reliability of the reading tests. The statistical analysis found that the Cronbach's Alpha coefficient for group 1 was 7.20 and for group 2 it was 7.09, which indicates an acceptable reliability based on the reliability scale developed by Tavakol and Dennick (2011).

Inter-rater reliability was used for increasing the reliability of the reading comprehension tests. Inter-rater reliability is understood as the extent to which raters coded the same units of data in the same way (Syed & Nelson, 2015). In this study, Helen was invited as an independent rater to review 30% of the reading tests to ascertain the reliability of the results of the assessment. Her scoring results were compared with those of the researcher to identify the percentage

agreement between the two raters. The Cohen's kappa at 9.36 indicates a high level of agreement between Helen and the researcher.

3.6.2 Validity

Validity is concerned with the meaningfulness of research components. The issues related to validating the findings of this study were taken into consideration in its design. Specifically, these were triangulation, classroom observations, and technical supports.

Cohen et al. (2007) suggested that a triangulation frame be used to ensure the external validity of any research. In this research, methodological triangulation was used to develop a comprehensive understanding of the phenomena (Carter et al., 2014). Correspondingly, this study collected data from several sources such as reading comprehension tests, survey questionnaires, interviews, observations, and/or students' artifacts. The multiple data collection methods helped the researcher gather rich data because they were mutually supportive and could be used to back-up other methods (Kabir, 2016).

Creswell (2015) suggested researchers to spend prolonged time in the field to "develop an in-depth understanding of the phenomenon under study and convey detail about the site and the people that lends credibility to the narrative account" (p. 202). In this study the researcher had prolonged engagement as a persistent observer of both groups during the seven weeks of the reading course. Spending a relatively long time at the classroom enabled her to check for misinformation that she or others may have introduced, and to build trust with the participants and thus facilitate the collection of interview data (Creswell & Miller, 2010).

Using technical support can also help to validate the findings of a study (Cohen et al., 2007). In this project, technical means were used to record, store, retrieve and analyse the collected data. As mentioned earlier, the quantitative data analysis process was conducted using SPSS under

the consultancy of the Centre for Statistics and Mathematics at Western Sydney University. Technology was also used for qualitative data collection and analysis. The interviews were recorded with a quality recorder and the coding was conducted using Nvivo software. Using a coding software helped the research identify the frequency of themes more easily and arrange the information more systematically.

Moreover, another technique used to enhance the validity for qualitative used in this study was member-checking. After each question, the researcher summarised briefly the student's answer and sought students' confirmation. If the student disagreed with any information in the summary, the researcher would ask for his/ her clarification and took notes about the interview. Birt et al. (2016) stated that member-checking helps the researcher increase the accuracy of the information collected in the interviews. Hence, it is an effective strategy to enhance the validation of qualitative data in this study.

3.7 Ethical concerns

According to Ramrathan et al. (2017), "Research ethics have become a central issue in educational research and no research can be conducted without due regard to ethics" (p. 432). An ethical framework was set up and strictly followed to ensure that no harm could be caused to the research participants. It provided guidance with regard to consent, privacy and confidentiality. Before data collection commenced, the Human Research Ethics Committee of Western Sydney University reviewed and approved the study plan according to the university's ethical code of conduct (see Appendix 15).

In order to recruit participants and research group members for the research, it was necessary that the consent issues be addressed. Before the reading course began, the PIS and ICF (Appendices 12 and 13) were delivered to the students. In the PIS, all the information related to the project and the participants was clearly articulated to avoid any ambiguity and participants

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were asked to sign an informed consent form to show they were volunteering to participate in the project. In the ICF, students could choose the tasks that they were willing to take part in by selecting from a list. Neither the researcher nor Theresa, the student coordinator, was present at the classrooms during participant recruitment to avoid influencing the students' decisions.

The members of the research group – Theresa, Bianca, and Helen –received straightforward invitation letters and consent forms explaining the nature of the project (Appendices 10 and 11). These invitation letters explained the process, activities, and the time allotted for the study. Their consent was confirmed by signing the ICF, which included a list of tasks from which they could choose those they were willing to participate in. In all the information leaflets and consent forms for the students and the research group, the researcher also clarified that they could quit the project at any time if they felt uncomfortable about or were unwilling to continue participating in the study. The students were assured that their academic assessments and personal well-being would not be affected by their non-participation or withdrawal from the study.

Only students who had left their contact details after completing the questionnaires were chosen for the interviews on metacognition. By leaving the contact details these students agreed to have a one-to-one interview and that the information they provided would be used as data in the study. The interviews were recorded and permission from the interviewees was sought before each interview. At the beginning of each interview, the researcher briefly introduced the interview process, summarised the research, and gave the approximate time that the students would spend at the interview. She also reconfirmed each participant's right to withdraw from the interview at any time.

During the interview, the researcher tried to create a comfortable atmosphere by showing her interest in the participants' stories and allowing them as much time as they needed to fully

elaborate on or explain points that were of interest to them. She conducted the interviews as conversations in order to avoid the impression that she was merely collecting data.

Protection of the participants' anonymity and confidentiality were maintained by creating pseudonyms after the data were collected. The list of names and pseudonyms remains confidential, and only the researcher and her academic supervisors have access to it. In order not to disadvantage the CG relative to the EG, the researcher arranged another CCMAL reading course for the CG participants after the data collection had finished. Bianca conducted this reading course for the CG in the same way it had been delivered to the EG.

Taking part in this study required a considerable amount of the participants' time. They had to devote two hours every week to attend the seven-week reading course, write seven reflective journals, and attend an interview after the reading course. A small gift was given to each participant at the end of the reading course as the researcher's acknowledgement of their efforts. The gifts were innocuous and adhered to the ethical code of conduct (Grant & Sugarman, 2005).

The research group members who helped the researcher during data collection and analysis were paid for their participation in the project. To acknowledge their effort, time, and contribution, each received a gift card worth AUD 200.

3.8 Chapter conclusion

This chapter has discussed the overall methodological approach of the study. As a concurrent mixed methods study, it used multiple methods of data collection involving both qualitative and quantitative data sets. Post-positivism was adopted as the theoretical perspective that guided the data collection and analysis.

With the aims of examining the possible influences of CCMAL on students' metacognition and reading comprehension and identifying the factors that influenced the ways students use CCMAL for reading comprehension, this study used five data collection methods: reading comprehension tests, survey questionnaires, interviews, classroom observations, and students' artefacts. This chapter explained and justified each of these methods.

The quantitative and qualitative data analyses were also described. The quantitative data analysis was conducted using the SPSS package. Descriptive statistical methods were used to examine the possible influence of CCMAL on students' metacognition and reading comprehension. The qualitative data were analysed using thematic analysis and selective coding methods, facilitated by the use of the NVivo software. Coding was conducted based on grounded theory coding guidelines in order to collect as much interesting information as possible. To ensure the reliability and validity of the study design, Cronbach Alpha, "split-half", and inter-rater reliability were used. As validity strategies, the study design involved methodological triangulation, fieldwork, and technical support.

An ethical framework was created and strictly adhered to, and this chapter has outlined the various strategies used to protect the wellbeing, consent, privacy, and confidentiality of the participants in the study.

The researcher's stance was as an empathetic observer who was a neither complete outsider nor a complete insider. This allowed her to collect and analyse the data objectively and to situate herself in the participants' position for a better data interpretation. As Blaikie (2007) put it, "Only by grasping the subjective meaning used by the social actors can their (the participants') actions be understood" (p. 10).

The next chapter presents the research findings from both the quantitative and qualitative data analyses. Statistical findings calculated using SPSS describe the influences of CCMAL on the

students' metacognition and reading achievements. The findings from the qualitative data provide a more comprehensive picture of the extent to which the students' metacognition and reading outcomes were influenced by CCMAL.

CHAPTER 4: THE INFLUENCE OF CCMAL ON STUDENTS' READING COMPREHENSION SKILLS

4.1 Introduction

As discussed in Chapter 2 (section 2.3), the term "concepts" is used in this study to refer to people's psychological representations of categories (e.g., apple, table, etc.) in which categories are entities of specific topics. Cognitive theorists have assumed that concepts are represented by the lists of linguistic features that describe the characteristics associated with a category's member (Barsalou et al., 1999; Solochak & Pesina, 2014). For example, a category "animal" consists of members such as mammals, birds or reptiles. These conceptual representations are connected to form the semantic networks based on the propositional logic.

A concept map is a node-link diagram showing the semantic relationships among concepts (Schwendimann, 2014). In a concept map, concepts are connected by propositions that indicate how these concepts are semantically related. Hence, concept maps are an effective tool for representing the concepts and their propositional relationships.

Chapter 2 also explained that CCMAL refers to computational concept mapping situated in authentic learning contexts. Lombardi (2007) claimed that authentic learning relates to the real world outside of schools. The reading topics used in this study (Family, English, Music, Long-lived People, Ghosts, Traveling and Food) were able to be embedded in authentic learning contexts as they involved real-world information that was relevant to students' knowledge and experience. The use of authentic reading topics that are familiar to students' daily lives can facilitate their reading comprehension and thus their concept mapping.

This study adopts Afflerbach et al's (2008) definition of reading comprehension skills: "[the] automatic actions that result in decoding and comprehension with speed, efficiency, and fluency and usually occur without awareness of the components or control involved" (p. 368).

In addition, it draws on Kendeou et al.'s (2012) work to characterise text comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language.

As also presented in Chapter 2 (section 2.2), the reading comprehension models introduced by Broek et al. (2005) classified reading comprehension into three levels: literal comprehension, interpretive comprehension, and inferential comprehension. Literal comprehension involves the automatic recognition of words and the locating of specific information that is directly in the text, the title, headlines or captions. Interpretive comprehension requires students to reflect on literal information, make links between information, identify relationships, and draw inferences. Interpretive comprehension skills include sequencing events from texts, extracting information from visual cues such as maps or diagrams, connecting information from the text and visual aids, making connections between information from consecutive sentences, and linking information from different sentences in the text. Inferential comprehension focuses on the use of resources that are closely aligned with the reading processes, such as students' background knowledge. Inferential comprehension skills include connecting ideas across sentences and paragraphs, inferring the meaning of information in the text, deducing main ideas or themes in the text, identifying the meaning of unknown words based on textual cues, identifying the meaning and purposes of metaphorical devices, and identifying synonyms or antonyms in the text to connect ideas.

Undergirded by the convergent mixed methods methodology described in Chapter 3, this study has addressed the following three research questions focusing on CCMAL:

1. How does CCMAL influence students' reading comprehension skills?

2. How does CCMAL influence students' metacognition?

3. What are the possible factors that influence students' CCMAL learning experiences?

Throughout this thesis, the terms CCMAL and intervention are used interchangeably. The findings and discussions of both the quantitative and qualitative analyses are set out in Chapters 4, 5 and 6, each of which respectively addresses one of these research questions. This first analysis chapter thus focuses on investigating the influence of CCMAL on students' reading comprehension skills. Data needed to address RQ1 were collected from quantitative sources (pre- and post-tests on reading comprehension and students' scores on concept maps) and qualitative sources (interviews, learning journals, observation field notes, and students' concept maps). Quantitative data was collected from 100 pre-tests on reading comprehension (50 EG students and 50 CG students) and 90 post-tests on reading comprehension (44 EG students and 46 CG students). Qualitative data were collected from 12 individual interviews of EG students, 43 learning journals (23 learning journals from EG and 20 from CG), 77 concept maps (25 from CM1, 28 from CM2 and 24 from CM3), 14 observation field notes (seven of each group), and the open-ended questions of the reading tests. Of the EG students, there was one student who only participated in the interviews and twelve others who only participated in the submission of the learning journals. Eleven EG students participated in interviews and submitted learning journals.

Section 4.2 presents the quantitative evidence of the influence of CCMAL on the students' scores on reading tests. This is followed in section 4.3 by the qualitative data related to how CCMAL influenced the students' comprehension skills. Section 4.4 discusses the research hypotheses and the ways CCMAL influenced the students' reading comprehension skills. Section 4.5 concludes the chapter.

4.2 Quantitative evidence of the positive influence of CCMAL on the students' reading achievements

In this study, 100 university students from Eastern Star University were invited to attend a 7-week reading course conducted independently of their learning curriculum. All the participants were first-year students, and their proficiency was at a beginner level based on the enrollment test results of the university (see Chapter 1 for students' beginner-level proficiency). As described in Chapter 3, there were seven reading texts for the course, all selected from the book *English File* (Latham-Koenig et al., 2012), which was the official textbook at the site university. The 7-week reading course was delivered to the students of both the EG and the CG. Students of the EG used CCMAL for reading, while students of the CG were exposed to traditional learning environments that relied on teacher-centered instruction methods (section 1.1, Chapter 1). All students were invited to undertake a pre-test and a post-test on reading comprehension (Appendices 1A and 1B).

During the reading course, the students of both groups were asked to complete a learning journal on a weekly basis. EG students were asked to submit their concept maps at the beginning, mid-way and completion of the reading course (weeks 1, 4 and 7). After the reading course, 12 EG students were also invited for individual interviews.

In the intervention, the EG students used CCMAL for reading comprehension, while the CG students were exposed to traditional learning environments. Before the reading course, the mean scores of the pre-tests on reading comprehension of two groups of students were compared by performing an independent samples t-test. The analysis showed no significant differences in the students' reading comprehension between the EG and the CG at $p = .58 > .05$ (Table 4.1).

Table 4. 1: Means and Standard Deviations of Pre-Tests by Experimental Group and Control Groups

Group	N	M	SD	Mean Difference	P
EG	50	5.30	2.15	0.26	.58
CG	50	5.04	2.25	0.26	

*denotes statistical significance at P<.05

After their exposure to CCMAL, scores on reading comprehension of the EG students improved sharply, with a mean difference of M = 1.52. A paired samples t-test was conducted to compare the EG students' reading scores before and after the reading course. The statistical analysis showed that the p-value was .00 < .05. This demonstrated that the differences between the EG students' outcomes on reading comprehension before and after the intervention were statistically significant.

There was no significant difference (p value at .06) between the pre- and post-test scores on reading comprehension for the CG students (Table 4.2). The mean difference between the pre and post-test scores on reading comprehension for CG was M = .11, which is lower than that of the EG (M = 1.52).

Table 4. 2: Means and Standard Deviation of Pre- and Post-Tests by Experimental Group and Control Group

Group	Pre-test			Post-test			Mean Difference	p
	N	M	SD	N	M	SD		
EG	44	5.43	2.16	44	6.95	2.26	1.52	.00*
CG	46	5.09	2.58	46	6.00	2.25	.11	.06

*denotes statistical significance at *p < .05

Furthermore, the mean score on post-test reading comprehension of the EG was higher than that of the CG. The mean difference between the EG's average score on post-test and the CG's average score on post-test was M = .95, with p value at .04, implying that the mean difference between the post-test scores on reading comprehension of the EG and the CG was significantly different (Table 4.3). The reading comprehension of both groups improved; however, students of the EG were shown to achieve significantly better improvements in reading comprehension than those of the CG.

Table 4. 3: Means and Standard Deviations for Post-Test on Reading Comprehension by Experimental Group and Control Group

Group	*N*	*M*	*SD*	Mean difference	*P*
EG	44	6.00	2.26	0.95	.04*
CG	46	6.95	2.25		

*denotes statistical significance at *p< .05

Correlation analysis was performed to examine the relationships between the EG students' reading achievements and their concept map construction ability (Table 4.4). It was found that there was no correlation between the students' scores on the post-tests on reading and their scores on the concept maps collected in week 1 (CM1), with a correlation coefficient of p = .90. However, the statistical analysis showed that the scores on the students' post-tests on reading were correlated to their scores on concept maps collected in week 4 (CM2) (p = .00) and concept maps collected in week 7 (CM3) (p = .00). This suggests that the EG students' reading outcomes had a significant and positive correlation with their concept mapping scores in the second half of the intervention.

Table 4. 4: Means, Standard Deviations, and Correlations Between Reading Outcomes and CM 1, CM 2 and CM3 with confidence intervals

Variable	*M*	*SD*	*1*	*2*	*3*	*4*
1. Reading outcomes	6.95	2.26	-			
2. CM1	6.68	1.52	.90	-		
3. CM2	7.68	1.28	.00*	.27	-	
4. CM3	10.13	1.66	.00*	.46	.01*	-

*denotes statistical significance at *p< .05

Multiple regression was run to examine whether the EG students' scores on CM2 and CM3 scores could predict reading comprehension. The regression analysis was conducted using the Enter method. As presented in Table 4.5, the independent variables significantly predicted students' scores on reading comprehension, $F(2, 12) = 19.56$, $p < .05$. The $R^2 = 76.5$ indicates that the students' scores on concept mapping could explain the 76.5% variance of their reading comprehension scores. The analysis shows that the students' scores on CM2 did not significantly predict their scores on reading comprehension at $p = .34 > .05$; however, the students' scores on CM3 did significantly predict their reading comprehension scores, with $p = .00 < .05$.

Table 4. 5: Regression Model Summary for Concept Mapping and Reading Outcomes

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.875	.765	.726	1.42

Predictors: (Constant): CM2, CM3

Dependent Variable: Reading outcomes

Shapiro Wilk test was conducted to test the multivariate normality of the students' scores on reading comprehension. The p value at .30 > .05 indicated that these scores did not differ significantly from the normality. In other words, the EG students' reading comprehension scores were approximately normally distributed.

The scatterplot analysis (Figure 4.1) shows that there was a positive and linear association between the students' scores on concept maps and their scores on reading and it suggests that when the EG students' concept mapping scores improved, their reading comprehension scores also increased, thus indicating that they comprehended the texts better when their concept mapping skills improved.

Figure 4. 1: *Scatterplot for Regression of Students' Scores on Concept Maps and Reading Comprehension*
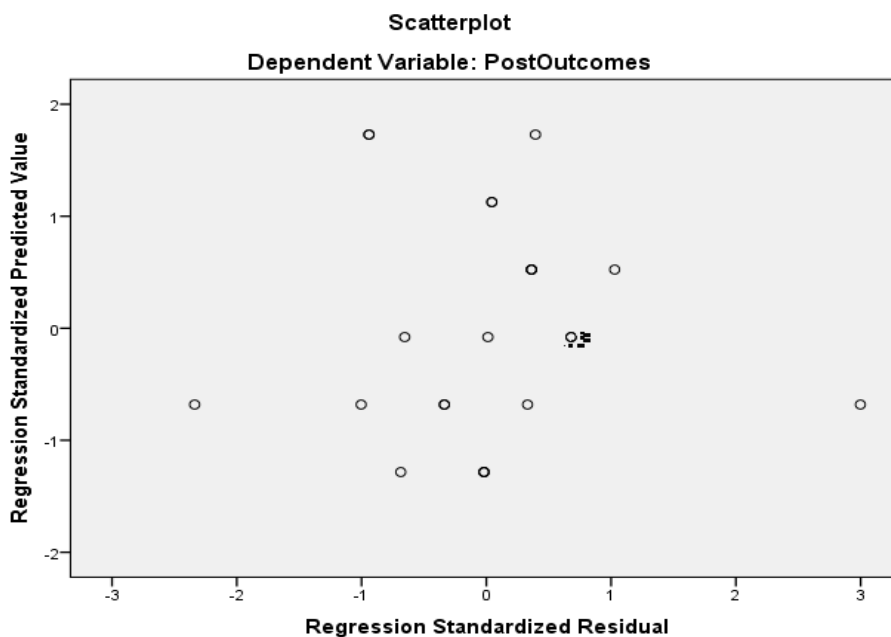
In summary, the quantitative evidence shows that the students who were exposed to CCMAL were able to perform better in reading comprehension tests than those who did not go through CCMAL. These students' improvements in reading comprehension scores might imply an improvement of reading skills by week 7. The next section provides qualitative insights into

the types of reading comprehension skills that the students developed during the reading course.

4.3 Qualitative evidence of the influence of CCMAL on students' reading achievements

As mentioned in Chapter 3, the topics of the texts selected for the seven weeks of the reading course were "Family", "English", "Music", "Long lives", "Haunted houses", "Traveling" and "Food". In the weekly session, the EG students were asked to read the reading text and construct a concept map while the CG students had their lesson in a traditional manner. This section presents the influence of CCMAL on the students' development of reading comprehension skills.

4.3.1 CCMAL develops Literal, Interpretive and Inferential skills

According to Broek et al. (2005), reading comprehension involves three levels of skills: literal comprehension, interpretive comprehension, and inferential comprehension. In this study, it was found that the students of both groups developed various reading comprehension skills during the reading course. As presented in Chapter 3, the reading tests were designed to assess students' development in literal skills (test items 1, 3 and 8), interpretive skills (test items 3, 6, 7, 10 and 12) and inferential skills (test items 4, 5, 9 and 11). Figure 4.2 synthesises the reading comprehension skills based on the EG students' perceptions through the interviews and learning journals, as well as the CG students' weekly learning journals. The students' concept maps provide further information about the range of reading comprehension skills developed in the reading course.

Figure 4. 2: *Reading Comprehension Skills Developed by the EG and the CG*
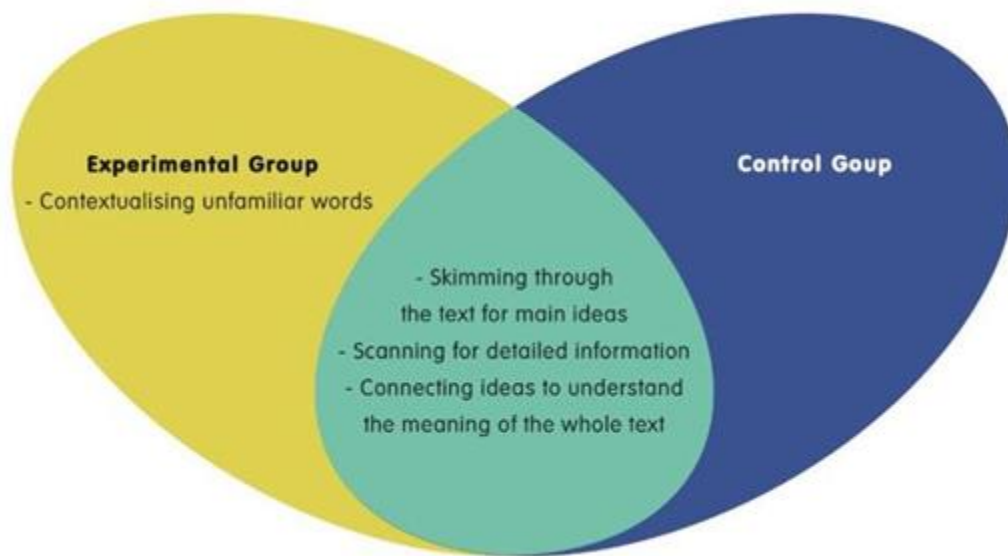
As shown in Figure 4.2, the students of both groups developed a wide range of reading skills during the reading course. In the context of this study, skimming refers to quickly reading through the text to get the main ideas conveyed in it, and scanning refers to identifying the specific words that contain detailed information, such as key concepts, names, dates, and places, and connecting ideas refers to linking the information in different sentences or paragraphs for text comprehension (Broek et al., 2005).

The observation field notes show that the students were given reading comprehension tasks that targeted a range of reading comprehension skills. In week 1, students developed literal comprehension skills such as scanning. The reading text in week 1 was about "Family" and task b asked them to read the text and choose the correct answers for the given questions. Figure 4.3 shows the reading text in week 1 and Figure 4.4 shows reading task b.

Figure 4. 3: *Reading Text about Family*

I'm Isabel. I work in a coffee shop in the subway. That's my
boyfriend. Alex. 26. He's a policeman and he loves his job. He also
likes fishing in his free time and we like to go to the Winn Lake on
weekends. We are getting married next year, and I am so excited to
be his wife. He's so sweet.

And this is my dad. He is turning 65 this year but he doesn't look like
65. He must be a handsome man in his young age. He's retired now
but he likes taking part in local community projects to help collect
clothes and books for children in need. He always wants them to
have good life and good education.

That's Gloria, my stepmother. She looks quite beautiful and elegant.
She's a hairdresser and she's a very nice person. She often does
my hair for free. I sometimes come and help her in the shop when
she gets too busy.

This is my brother. He is a student and he studies chemistry. He is tall and slim
but he does not like to go to the gym. He moved out with his girlfriend last year
but they visit us quite often.

That's Natalie. My brother's girlfriend. I don't really like her. She thinks she's
intelligent but she's not really. She's a university student. She studies French but
she can't speak it very well.

Figure 4. 4: *A Reading Task for Students of Both Groups* (Task b, Week 1)

b. Choose the answers for the following questions.
    a. How old is Isabel's boyfriend?
    ☐   65
    ☐   26
    ☐   Next year
    b. What does Gloria do?
    ☐   a student
    ☐   studies French
    ☐   a hairdresser
    c. What does Isabel's father do?
    ☐   He is retired.
    ☐   He collects clothes and books for children in need.
    ☐   He studies Chemistry.

To complete this task, students had to scan for the detailed information related to the age of

Isabel's boyfriend, Gloria's job, and Isabel's father's job. The students might have scanned

through paragraph 1 and learnt that Isabel's boyfriend is 26 years old. In the third paragraph, students might have scanned through the sentence "She's a hairdresser and she's a very nice person." This means that the correct answer for question (b) is "a hairdresser". Similarly, question (c) requires students to scan through the second paragraph. Students might have found that Isabel's father is retired.

In week 4, through CCMAL, the students also had opportunities to reinforce different reading skills. They were asked to read a reading text which was about long lives. Figure 4.5 is the text in week 4.

Figure 4. 5: *Reading Text About Long-Lived People*

Reading comprehension task a asked students to read through the text to know the general idea of the text and to select the things that helped people to live to be a hundred years old. Figure 4.6 is reading comprehension task a.

Figure 4. 6: *A Reading Task for Students of Both Groups* (Task a, Week 4)

a. **Work in pairs. Read through the text and answer what the text is about. Then tick five things which you think help people to live to be a hundred.**
☐ They have a big family.
☐ They are not in a hurry.
☐ They sleep eight hours.
☐ They have pets.
☐ They hardly ever eat meat.
☐ They drink a little alcohol.
☐ They often go to the doctor.
☐ They work outside.
☐ They often see friends.

To skim a text is to read the text quickly to find out the general theme, topic or meaning, whereas to scan a text is to read the text quickly in order to find specific information (Aritonang et al., 2018). Hence, to accomplish this reading task, the students had to skim through the text to get the main ideas of the text, which is about the lives of long-lived people. They also had a chance to practise scanning for specific information about the long-lived people. After scanning through the text, in the first and second paragraphs they might have found the ideas that long-lived people hardly ever eat meat and work outdoors in the fields. And in the second and the third paragraphs they might also have found the ideas that long-lived people drink little alcohol and often meet their friends. The idea that long-lived people are not in a hurry should be found in the last paragraph. To accomplish this task, the students had to find the overview of the text that presented these main ideas and then identify the specific ideas

in the text. Hence, this reading task aimed to develop the students' skimming and scanning skills.

In the above task, the options presented to the students could have drawn on their prior knowledge of ways to live to at least 100 years old. Because "long-lived people" was a popular topic, they might also have known or read about long-lived people in their own lives. Although options such as long-lived people "have a big family", "sleep eight hours", "have pets" or "often go to the doctor" were not directly mentioned in the reading text, the information conveyed in these statements also reminded the students of what they had already read or experienced about long lives.

The reading comprehension task b of reading text 4 asked the students to find the place that had the special features mentioned on the list. Figure 4.7 is reading comprehension task b.

Figure 4. 7: *A Reading Task for Students of Both Groups* (Task b, Week 4)

> **b. Read the article again. In which places are these things important?**
> 1. A special kind of water   _____
> 2. A special kinfd of food   _____
> 3. The weather   _____
> 4. A special kind of drink   _____

To accomplish this task, the students should have scanned through the text to find the detailed information of "a special kind of water", "a special kind of food", "a special kind of drink" and the place with "weather". They might have found that the water in Vilcabamba (which is in Ecuador) was "very rich in mineral" and its temperature was "between 18 and 27 degrees". Thus, "a special kind of water" and "the weather" are two important things to Vilcabamba. The students might also have found that people in Ogliastra like "grappa" – a kind of local drink –

and Okinawans love "soya". This means that "a special kind of drink" is important to people in Oglistra and "a special kind of food" is crucial to an Okinawan's life. This reading comprehension task developed the students' scanning skills because it encouraged them to locate specific information in the text.

Data from the students' learning journals were consistent with the above findings. Their journals revealed that they developed a wide range of reading comprehension skills, including skimming for main ideas and scanning for specific information. The following quotations are from the learning journals of an EG student and a CG student:

> *I think my skimming and scanning skills improved a lot during the past four weeks. Today, there was a reading task which asked about the general idea of the text, made me skim through the text while another reading task made me scan through the text for specific details of the long-lived people in different areas in the world.* (Thanh Hang, Learning journals, CG, Week 4)

> *This week, I had to practice skimming and scanning skill a lot by using concept mapping. I think my skimming and scanning improved a lot because the concept map was made from the ideas, so I had to quickly look through the text to get the main ideas for the concept map; I also had to san for some detailed information to explain the key concepts. These skills helped me understand the text better because they helped me find the main ideas in the text and specific information.* (Manh Tien, Learning Journals, EG, Week 4)

Manh Tien, a student from the EG, said that concept mapping helped him develop skimming and scanning skills. Skimming through the text helped him identify the main ideas of the text. These ideas could be presented in the form of the propositions in the concept map. Hence, concept mapping encouraged him to practise skimming intensively. As well, scanning helped him to identify additional information for the concepts in the concept map. Figure 4.8 is the concept map he constructed in week 4.

Figure 4. 8: *A Concept Map Constructed by an EG Student* (Manh Tien, Week 4)
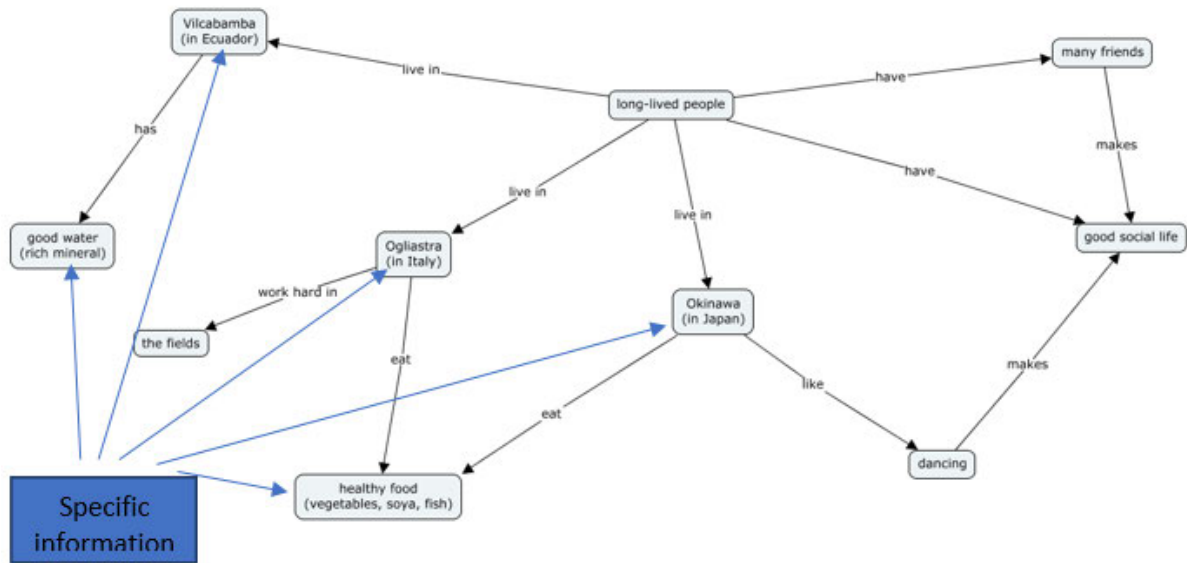
As indicated in Figure 4.8, Manh Tien added specific details as complementary information under the concepts in the nodes. For instance, "rich mineral" is the detailed information of the concept "good water" to explain why the water in Vilcabamba is good, or "vegetables, soya, fish" are the examples of healthy food. He used specific details from the text to provide more information about the concepts in the nodes. The proposition "Vilcabamba has good water" could be "Vilcabamba has 'good water' (which contains minerals)". This proposition became more specific and more comprehensive after details were added. This shows that concept mapping encouraged the students to practise scanning for detailed information.

Data collected from the interviews also show that the students recognised they had been relying on skimming and scanning as reading comprehension strategies. A student from the EG said:

> *[Concept mapping] helps me improve the skills that I haven't fully developed such as skimming and scanning… To answer the focus questions for the concept map, I had to read quickly the text. So, my skimming skill has improved a lot. I also found the concepts for the map by scanning though the text.* (Thu Trang, EG, Interviews)

Concept map construction often starts with a focus question – "What is the map about?" – which aims at identifying the main topic of the concept map (Novak & Canas, 2008). In this study, the topic of the concept map was based on the main theme of the reading text. Hence, in order for students to develop a concept, they inevitably had to skim through the text and identify the topic of the text. This is necessary in concept mapping because a concept map includes two basic components: the nodes, which contain the concepts, and the links, which indicate the relationship between two concepts. In this study, identifying the key concepts in the text in order to complete reading comprehension tasks a and b thus encouraged the students' text scanning skills.

Moreover, the data show that the students developed interpretive comprehension skills during the reading course. Specifically, they were able to connect ideas in the text to better understand it. In week 7, the students were asked to read a text that described the eating habits of three people: Laura, James and Lionel. Figure 4.9 shows the reading text for week 7.

Figure 4. 9: *Reading Text About Food*

What I ate yesterday

Laura Bailey *model*

Breakfast I never miss breakfast! I had some cereal and fruit, and a piece of toast. I'm a bit unusual because I have tea and coffee in the morning. I don't mind in which order, but I need to have both.

Lunch I was at my studio all day, so I got takeaway vegetarian sushi from a restaurant called *Itsu*. I became a vegetarian 20 years ago and now I can't imagine living any other way.

Dinner I picked up my children from school and we had a snack – cheese and biscuits. In the evening I went to my favourite pizzeria, and I had a vegetarian pasta dish, and two glasses of white wine.

James deGale *boxer*

Breakfast I woke up and went running for an hour and a half, then I came home and had a cup of tea and some porridge. Then I went to the gym and trained.

Lunch I had a bowl of pasta with chorizo and bacon in tomato sauce with cheese on top, and an apple and an orange. I have an important fight soon, so my diet has to be very strict now. Three meals a day, and no snacks.

Dinner I had a grilled chicken breast and vegetables – mushrooms, sweetcorn and tomatoes. My mum made it – she's a fantastic cook.

Lionel Shriver *writer*

Breakfast I had an enormous cup of espresso coffee with some milk and a little cream. It's all that I need and gives me energy for the whole day.

Lunch I don't eat lunch. I don't understand people who can eat three meals a day. How do they find the time to do anything else?

Dinner First I had a glass of sherry and a bowl of popcorn. Then I had grilled fish with some brown rice and vegetables – peppers and onions. For dessert I had a piece of chocolate cake. I drank red wine.

The week 7 reading task c required the students to read the text and choose the appropriate

statements for each of Laura, James and Lionel (Figure 4.10).

Figure 4. 10: *A Reading Task for Students of Both Groups* (Task c, Week 7)

> c. **Read the article again. Answer the questions with M (the model), B (the boxer) and W (the writer).**
> **Who ...?**
> 1. Doesn't like eating during the day
> 2. Doesn't eat anything between meals
> 3. Didn't have any home-cooked food for lunch or dinner
> 4. Had fruit for dessert at lunchtime
> 5. Never eat meats
> 6. Didn't drink any alcohol yesterday
> 7. Had a drink and a snack before dinner
> 8. Doesn't eat anything for breakfast
> 9. Has a strange breakfast habit

To select appropriate statements for each of these three people, the students had to connect the ideas in the text to understand them. For example, to find out whom statement 7 in reading task c is referring to, the students might have connected the ideas conveyed in "First I had a glass of sherry and a bowl of popcorn" and "Then I had grilled fish with some brown rice and vegetables." They could have argued that Lionel had "a glass of sherry and a bowl of popcorn," which is a drink and a snack, before having "grilled fish with some brown rice and vegetables," which is her dinner. Thus, the students might have selected the statement "had a drink and a snack before dinner" to describe Lionel's eating habit. Similarly, they might have connected the ideas conveyed in "I had an enormous cup of espresso coffee with some milk and a little cream" and "That's all that I need and give me energy for the whole day" to find another statement about her eating habits. They should have argued that "an enormous cup of espresso coffee with a little cream" is not food; it is a drink.

The expression "That's all that I need and gives me energy for the whole day," indicates that the speaker did not consume anything except coffee for breakfast. By connecting the ideas of the two sentences, the students might have concluded that statement (8) – "didn't eat anything for breakfast" – described Lionel's eating habits. By connecting the ideas conveyed in the text, they were able to choose the statements that best describe the eating habits of Laura, James and

Lionel. As a result, the students developed their skills in connecting ideas to understand the text better.

Evidence for students' idea connection was also found in their concept maps. Figure 4.11 is a concept map constructed by an EG student based on his understanding of week 7's reading comprehension.

Figure 4. 11: *A Concept Map Constructed by an EG Student* (Manh Tien, Week 7)
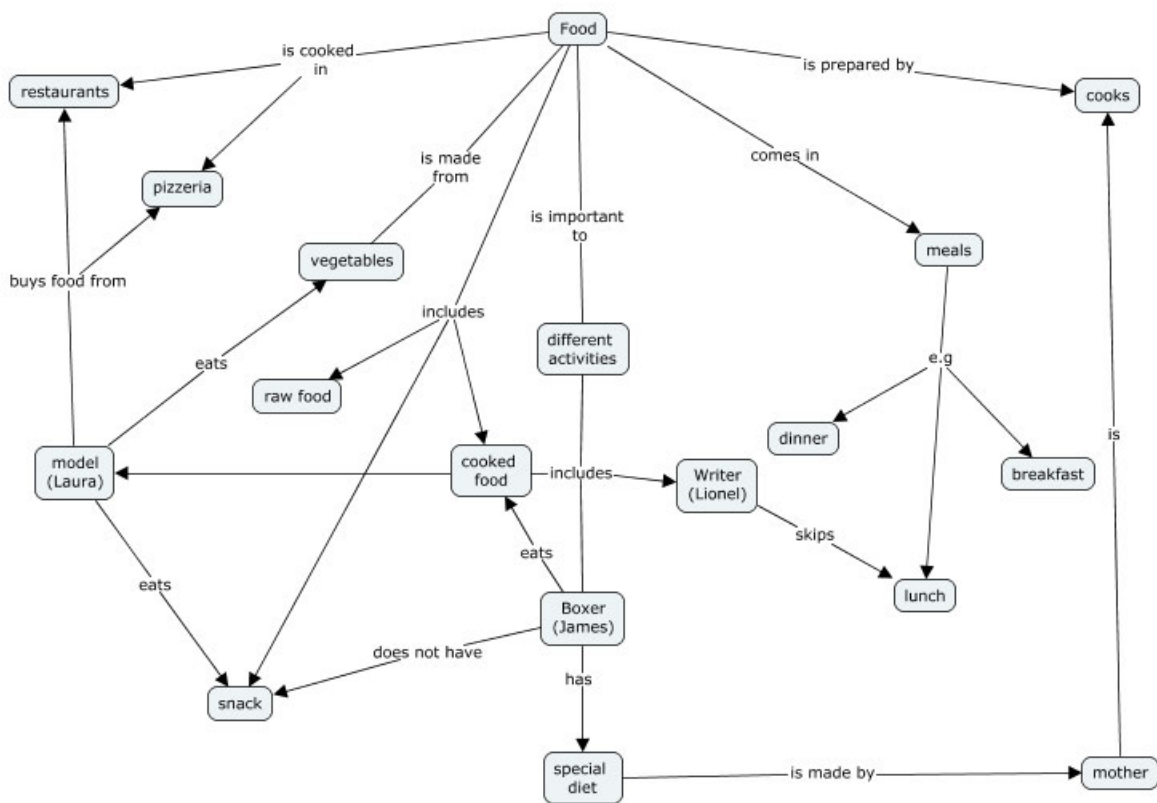
In this concept map, there are propositions constructed based on the student's connecting of ideas. For instance, the proposition "Food provides energy for different activities" might have come up from connecting the ideas conveyed in the introduction to the three people in the reading text: Laura is a model, James a boxer, and Lionel a writer. Similarly, the proposition "Food is sold in a pizzeria, a restaurant" might have formed by connecting the ideas in the text describing Laura's eating habits: "I got takeaway vegetarian sushi from a restaurant called Itsu"

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and "I went to my favorite pizzeria and had a vegetarian pasta dish." This student must have argued that Laura came to buy sushi and pasta in the restaurant and pizzeria; so, these places must be where food was sold. Because CCMAL includes propositions constructed by connecting ideas conveyed in the text, the relationship amongst these ideas became more visible to the students.

Of note from the qualitative data analysis was the EG students' ability to infer the meaning of a word using a particular context, a reading comprehension skill not evident amongst the CG students (see Figure 4.2). The students inferred the meaning of an unknown word from the context in which it was found. In other words, they intellectually "guessed" the meaning of unknown words by using contextualisation, which is the identification of the meaning of unknown words based on different strategies, such as using context cues or students' prior knowledge and experience. Ghebranejad et al. (2013) argued that word contextualisation is one of the most useful skills students can acquire in reading classes because "[t]o guess a meaning the reader must consider and interpret the available evidence, predict what should occur, and seek confirmation of the prediction. Thus, developing the skill of guessing meanings is in many ways developing the skill of reading" (p. 177).

Data from the classroom observations suggest that the EG students developed the skill of contextualising unfamiliar words during the reading course:

> *It was observed that none of the students used dictionaries for looking up the unknown words. Instead, they tried to guess the meaning of those words. Many of them were observed to be talking to their peers about guessing the words by connecting the other words in the text. Some students sitting next to me were observed to try to arrange the concepts on the concept maps and infer the meaning of the unknown concepts based on the propositions. These students were observed to be quick in making connections of ideas using concept maps. Some of them even did this without much hesitation.* (Observation field notes, EG, Week 7)

The observation field notes reveal that the use of concept maps helped the students guess unfamiliar words and connect ideas quickly. In a concept map, a concept is connected to other

concepts by propositions. Based on these propositions, the students were able to form the meaning of unfamiliar words.

The reading comprehension task d in week 7 required students to read the text about food and guess the meaning of the highlighted words. Figure 4.12 shows reading task d.

Figure 4. 12: *A Reading Task for Students of Both Groups* (Task d, Week 7)
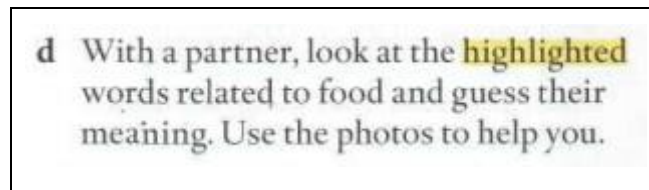
The reading text in week 7 was about food, and reading task d asked the students to guess the meaning of the highlighted words "toast", "takeaway", "dish", "bowl", "bacon", "sauce", "meals", "grilled", "breast", and "sweetcorn". They used concept maps to contextualise these unknown words. Figure 4.13 shows an EG student's concept map.

Figure 4. 13: *A Concept Map Constructed by an EG student* (Duong Hien, Week 7)
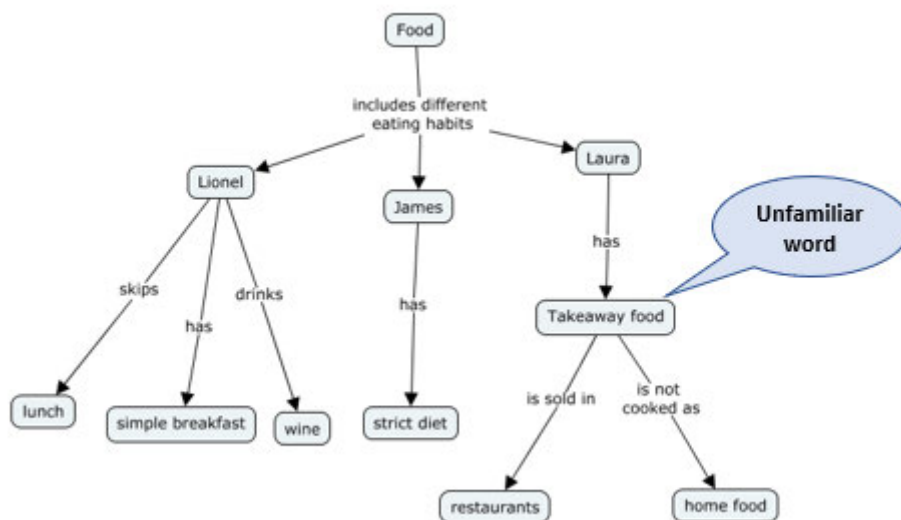
"Takeaway" is a highlighted word in the part of the text that describes Laura's eating style. To guess the meaning of the word 'takeaway', this student inferred from its connections with other concepts on the concept map in propositions like "Laura eats takeaway food," "Takeaway food is sold in (the) restaurant," and "Takeaway food is not cooked as home food." These propositions were formed based on information from different parts of the text: "Laura eats takeaway food" and "Takeaway food is sold in (the) restaurant" were mentioned within the sentence "I was at my studio all day, so I got vegetarian sushi from a restaurant called Itsu." This sentence also implied the proposition "Takeaway food is not cooked as home food." By connecting all these propositions, this student might have inferred that "takeaway" was a kind of food processed in the restaurants or pizzerias and people bought it for meals. She might also have inferred from her prior knowledge and experience and argued that people sometimes came to the shops to buy food and bring it home; therefore, this kind of food could be called "takeaway". This student might not have formed the definition for the word "takeaway", but she might have formed the notion about the meaning of this word as a type of food processed in the restaurant that people could go to for meals.

Data from the students' learning journals and interviews also suggest that their ability to guess the meaning of unfamiliar words improved after the reading course. The following excerpt is from Duong Hien, who used the concept map to contextualise unfamiliar words:

> *In a concept map, I could predict the meaning of the unknown word by connecting the words that I knew in the text. Today, the reading text was about food. We were asked to guess the meaning of some unfamiliar words such as "sweetcorn", "meals", "takeaway" ... I could guess the meaning of most of these words when I connected them with other words in the sentence or the paragraph.* (Duong Hien, Learning Journals, EG, Week 7).

In the interview response after the reading course, Duong Hien restated the use of concept maps for contextualising unknown words and constructing a semantic network based on the "short sentences" in the concept map:

Concept mapping was very useful in helping me with guessing the meaning of unknown words. For example, I don't know the word 'X' in the text. With concept mapping, I presented 'X' on the map. 'X' was connected with other concepts by the short sentences. Each proposition was a cue for me to predict its meaning. I am happy to say that this learning way has made me more confident in reading comprehension as my biggest problem was always lack of vocabulary. But now, with concept mapping, I could predict many new words in the text. (Duong Hien, Interviews)

In this case, "short sentences" refers to the propositions connecting the concepts on the map. The semantic network provided her with the cues for contextualising the meaning of the unknown concepts. Duong Hien also revealed that using concept mapping helped improve her skill in word contextualisation, thus increasing her confidence in reading comprehension.

In contrast, the qualitative data suggest that the CG students did not develop the skill of word contextualisation. They kept relying on the dictionary for the meaning of unfamiliar words. The observation field notes reported:

In week 7, the same reading task (see Figure 4.12) *used by the EG students were given to the CG students. I observed that the CG students were using dictionary to look up the meaning of unfamiliar words, namely "toast", "takeaway", "dish", "bowl", "bacon", "sauce", "meals", "grilled", "breast" and "sweetcorn". These words were highlighted in the reading text. These were the same words assessed in the reading tasks in the lesson for the EG students, as discussed previously. CG students were also observed to look up some other words which were included in the text but not included in the reading task but such as "unusual", "imagine" and "fantastic".* (Observation field notes, CG, Week 7)

The observation field notes in week 7 also reveal that although some students made efforts to guess the meaning of the unfamiliar words, their predictions were not very accurate:

While observing the students, I noticed that some students were not able to determine the meaning of the word "takeaway" which was assessed in reading task (d), but they were not using a dictionary to assist themselves in the task. (Observation field notes, Week 7)

In the learning journals, some CG students also revealed that they mainly used the dictionary when they found an unfamiliar word in the text. One student even complained about using the dictionary too much while reading:

I still had problems with learning the new words. Whenever I saw an unfamiliar word, I looked it up in the dictionary. It took lots of time to look up the dictionary. The reading comprehension repeated looking up new words and translating so it was quite boring to me. (Nguyen Mai, CG, Learning Journal, week 7)

This student seemed unsatisfied with her current method of learning vocabulary, which was focused on looking up the meaning of unfamiliar words in the dictionary. The student found it too time-consuming to look up every single unknown word during reading when there were so many of them. Moreover, the need to translate them from English to Vietnamese further increased the reading time and, arguably, made the reading process less enjoyable and possibly boring for the student.

4.4 Discussion

This section discusses the hypotheses of the influence of CCMAL on students' reading comprehension. The first hypothesis is "CCMAL has a positive influence on students' scores on reading comprehension" and the second hypothesis is "Students of the EG perform better than those of the CG". Moreover, this chapter discusses the ways CCMAL influences students' reading comprehension.

4.4.1 Hypothesis 1: CCMAL has a positive influence on students' scores on reading comprehension

As presented in section 4.2, the EG students' improvement in reading comprehension was found to be influenced by CCMAL. Their scores on reading comprehension were correlated with their scores on their concept maps. At the beginning of the reading course, their scores on CM1 were not significantly correlated to their scores on reading comprehension (r = -.03). However, there were significant moderate and strong correlations between their scores on reading comprehension and their scores on CM2 and CM3 (r = .58 and .86 respectively).

In this study, concept mapping was found to be a predictor of reading comprehension. Regression analysis indicates that the EG students' scores on CM3 could predict 74% of the variance in their scores on reading comprehension. This illustrates that as the students' concept mapping skills improved so did their reading achievement.

The quantitative data show that the EG students' scores on reading comprehension increased significantly after the reading course. Before the intervention, their averaged scores on reading comprehension were M = 5.43 (N = 44), and after the intervention, their averaged scores on reading comprehension were M = 6.95 (N = 44) and the mean difference between the pre- and post-test on reading was statistically significant.

This research supports the hypothesis "CCMAL has a positive influence on students' reading comprehension." This finding echoes those of (Khodadady & Ghanizadeh, 2011; Rassaei, 2017; Salehi et al., 2013; Trang, 2017), all of whom confirmed the positive influence of concept mapping on students' scores on EFL reading comprehension.

Kalanzadeh et al. (2014) found that the application of concept maps would not have any significant effect on the reading comprehension of EFL learners unless sufficient instructional strategies were put in place. In their study, the experimental group was exposed to concept mapping for five reading passages. Students might have needed more exposure to concept mapping to be fully influenced by it. This explains the current study's finding that the EG students' reading outcomes had a significant and positive correlation with their concept mapping scores in the second half of the intervention; their scores on CM2 did not significantly predict their scores on reading comprehension but their scores on CM3 did significantly predict their reading comprehension scores. These findings suggest that concept mapping has a gradual influence on the EG students' learning and reading comprehension; Kalanzadeh et al. (2014) had failed to document this due to their participants' shorter exposure to concept mapping. Hence, the findings of this study indicate that students should be provided with sufficient time and exposure to concept mapping if this instructional strategy is to be effective in developing their reading comprehension.

An important thing to note is that in the study conducted by Kalanzadeh et al. (2014), concept mapping was used in a more traditional manner, that is, participating students were asked to construct concept maps by a paper-and-pencil method. It is possible that this form of concept mapping failed to optimise the benefits of concept mapping as a learning method. The benefits of using technology for concept mapping have been reviewed in Chapter 2 of this thesis: computer-based concept mapping has facilitated students presenting a large number of concepts on the map, and made map corrections easier (Liu et al., 2010). In the current study, concept maps were constructed using computers; hence, it is likely that computer-based concept mapping could influence students' reading comprehension in a shorter period of time than paper-and-pencil concept mapping.

However, one of Kalazadeh et al.'s (2014) findings is supported by the current study. Although Kalanzadeh et al. (2014) did not confirm the positive influence of concept mapping on students' reading comprehension scores, they found that the use of concept mapping as a visual representation of knowledge helped to minimise the use of text (minimum use of text makes it easy to scan for a word, phrase, or general idea).

As have other studies (Farrokhnia et al., 2019; Tabatabaei & Khalili, 2014; Tajeddin & Tabatabaei, 2016), the current study found that concept mapping is a practical reading activity that can develop students' conceptual understanding by arranging ideas on the concept map as a semantic network. Conceptual understanding is arguably the underlying mechanism for meaningful learning and has been described as students intending to understand, together with the process of relating and structuring new ideas based on previous knowledge and experience (Trifone, 2017). Concept maps represent students' understanding of the text on the map and allow them to connect the information from the text to their prior knowledge in order to construct new knowledge (in the form of "propositions"). Therefore, concept mapping enhances students' conceptual understanding, which is critical in reading comprehension.

Moreover, concept mapping can direct students' attention to the critical information in the text and help them build internal connections among the ideas found in the text. It can also help them identify general concepts and scaffold the sequencing of learning tasks through progressively more explicit knowledge than can a conceptual framework (Tajeddin & Tabatabaei, 2016).

In this study, concept maps were used to illustrate the semantic relations in the text. The assumption is that the nodes and the lines or links in the concept maps can facilitate students' cognitive processing. Hence, the use of concept maps in reading classes is recommended.

4.4.2 Hypothesis 2: Students of the EG perform better in reading comprehension than those of the CG

This study found that students exposed to CCMAL had more improvement in reading comprehension than those without a concept mapping strategy; thus, the hypothesis "EG students perform better in reading comprehension than CG students" is supported.

Before the intervention, there was no significant difference in reading comprehension ability between the EG and the CG students. Although there was an increase in mean for the CG, there were no significant differences between their pre- and post-tests on reading comprehension. This suggests that the use of CCMAL as a learning strategy could be more effective in enhancing EFL learners' reading comprehension than traditional methods.

The current study reflects the findings of Tabatabaei and Khalili (2014), who confirmed that concept mapping had a more positive influence on the reading comprehension of EFL students at an Iranian university when compared with traditional approaches. In that experimental study, 60 participants were enrolled in a control and an experimental group (30 students were assigned to each group). The experimental group was instructed to use concept mapping in pre-reading activities to comprehend texts related to different topics, and the control group received

traditional instructions. The experimental group made more progress in their reading comprehension through using concept mapping than the control group. The researchers argued that concept mapping, by requiring students to identify concepts and the relationships between them, and to arrange the concepts and the links on the map, helped students better connect the ideas in the text. In addition, in order to "tell a full story" through the concept map, the experimental group students had to use concepts outside the text, which required making inferences from their real-life knowledge. When these students' skills to brainstorm and make inferences developed, their ability to process information in the text and, consequently, their reading comprehension improved.

In the context of Vietnamese tertiary education, Tuan and Thuan (2011) found that the use of concept mapping as a pre-reading activity helped improve students' reading comprehension. In the post-test on reading comprehension, students who were taught to use concept mapping as a pre-reading strategy outperformed those who followed their usual instructions. Taken together, these studies related to concept mapping as reading strategies show that concept mapping could be used as pre-reading activities (Tabatabaei & Khalili, 2014) or post-reading activities (Trang, 2017). In the current study, concept mapping was used in pre-reading, while-reading, and post-reading activities, and thus has shown that concept mapping can be used flexibly to facilitate students' text comprehension in different ways and at all stages of the reading comprehension process.

The current study involved seven descriptive reading texts as the learning materials. These texts were delivered to students during the seven weeks of the reading course and provided information about specific topics (e.g., Food, Family, English, Music, etc.). Beydarani (2015) confirmed that concept mapping had the largest influence on students' comprehension of descriptive texts. Descriptive texts, unlike chronological or cause-and-effect writing, do not have an understandable written procedure, and because they are mostly used in language

learning, students need to have a better understanding of them. Hence, relations among concepts can be provided by using concept mapping techniques.

However, the above findings were not aligned with that of Lechuga et al. (2015), who found that repeated retrieval activities had more a positive influence on college students' test performances than concept mapping. It is worth mentioning, however, that the advantage of retrieval practice over concept mapping varied as a function of the question types. Thus, the benefit of the repeated retrieval activities over concept mapping was limited to verbatim questions (Karpicke, 2017; Karpicke et al., 2014; Karpicke & Grimaldi, 2012).

In contrast, repeated retrieval learning was not shown to outperform concept mapping in regard to inference questions that required participants to elaborate on ideas by integrating pieces of information from different propositions. In other words, repeated retrieval learning seems to be useful only for simple memorisation of information. Karpicke and Grimaldi (2012) argued that repeated retrieval activities facilitated students' encoding, reconstructing and storing of knowledge but failed to help them construct new knowledge. Although the findings of the present study have confirmed the advantages of concept mapping over traditional textbook exercise approaches, Lechuga et al.'s (2015) results may slightly soften the idea that concept mapping is better in enhancing language learning than all traditional instructions.

4.4.3 The ways CCMAL influence students' reading comprehension skills

The findings presented in section 4.3 show that in the context of this study, CCMAL influenced students' text comprehension skills in terms of literal, interpretive and inferential comprehension skills. The EG students' improvement in connecting ideas was shown through the post-test on reading comprehension. Test item 12 of the post-test on reading comprehension was an open-ended question: "How did Tamara find out that she had a twin sister?" To answer

this question, students had to connect the ideas of different paragraphs in the reading passage.

Figure 4.14 is the reading passage of the reading test.

Figure 4. 14: *Reading Passage 2 of the Post-Test on Reading Comprehension*

Paragraph 1	Something very strange happened to Tamara. She never knew she had a twin sister until she started university!
Paragraph 2	Tamara was born in Mexico. Her parents could not look after her so she went to live with a family in Manhattan, USA.
Paragraph 3	When Tamara was twenty years old, she started university in Long Island. She enjoyed her university life. But one day she was walking home from class, and a student smiled at her. "Hello Adriana!" said the student. "I'm not Adriana," said Tamara.
Paragraph 4	This happened to Tamara again and again. People Tamara didn't know kept calling her Adriana. It was very strange. One day, when a woman called her Adriana, Tamara asked "Why do you keep calling me Adriana?"
Paragraph 5	The woman replied, "You look like my friend Adriana. You have the same face and the same hair. Is Adriana your sister?" Tamara said that she did not have a sister called Adriana. But she was interested in this girl Adriana. Finally, she asked someone for Adriana's email address.
Paragraph 6	When Tamara wrote to Adriana, she found out that they both had the same birthday, they looked the same and both of them were from Mexico. When Tamara went to live with the family in Manhattan, Adriana moved to Long Island to live with a family there. It had to be true! Adriana and Tamara were twin sisters!

Paragraph 1 introduces the story about how a girl named Tamara found out that she had a twin sister. Paragraph 2 mentions where Tamara was born and why she was adopted. This paragraph discloses that Tamara was adopted from Mexico, this implied that she might have unknown sibling(s). Paragraph 3 is about people's confusion between Tamara and another girl named Andriana when she started university and more examples for this confusion was provided in paragraph 4. Paragraph 5 describes Tamara's curiosity about the girl named Andriana and how she contacted the girl. The last paragraph synthesises all the clues proving that Andriana is Tamara's twin sister: they had the same looks; they had the same birthday and they both came from Mexico. This paragraph then concludes that Andriana and Tamara are twin siters.

Answering this question required the EG students to synthesise information by connecting the ideas of the paragraphs. One EG student's response shows his ability to synthesise information:

> *Because Tamara was confused with another girl by many people and she found out that they didn't only have the same looks, they also had the same birthday, and they were both adopted from a Mexican family.* (Manh Tien, Post-test on reading comprehension, EG)

The above finding echoes those of Kalhor and Shakibaei (2012) and Usman et al. (2017), who claimed that using concept mapping helped students develop and reinforce their ability to connect ideas in the text. Creating a map provides a general idea of the text itself, its keywords, and the concept sequences and of relationships between different parts of the text in a summarised form, and this pictorial summary allows for text reviewing and reciting and the connecting of information.

Concept maps include propositions or semantic units as the main units that compose their meaning (Marriott & Torres, 2016). Thus, propositions are the general information of the text. General information does not always come within a single sentence, it could be constructed by connecting ideas across sentences or paragraphs. Concept mapping encourages students to connect ideas of different parts of the text to generalise information and present it in the form of the propositions. Finding the relationships among words can lead to deeper conceptual understandings that allow students to learn facts and procedures in more useful and profound ways that transfer to and embed themselves in real-world knowledge and experience (Sawyer, 2008). Concept mapping facilitates students' reading comprehension by helping them develop reading comprehension skills and improve their conceptual understanding, thus enabling an authentic learning environment.

The current study also found that concept mapping helped the EG students develop inferential comprehension skills. In particular, CCMAL helped students guess unfamiliar words by putting language items in real contexts (e.g., textual context and students' prior knowledge). By supporting students to infer unknown words by contextualising them in this way, concept

mapping helped them improve their conceptual understanding and thus their text comprehension.

Data from reading comprehension tests show that only nine out of the 50 EG students selected the correct answers for test items 4 and 9, which asked the students to choose a definition that best described a word taken from the reading passages of the reading comprehension tests. In the post-test, 18 out of 46 EG students answered both items correctly. Given that modifications were made to the test items to prevent the students memorising the test answers (the questions were reshuffled, and the options were reordered), these statistics demonstrate an improvement in their ability to contextualise unfamiliar words.

Test item 4 in the post-reading test was designed to ask the students to determine the meaning of the word taken from the first reading passage. This was a multiple-choice question that required finding the word that had a similar meaning to "depict" in line 6 of the reading passage. Figure 4.15 is part of the reading passage of the test.

Figure 4. 15: *A Test Item From the Reading Comprehension Test* (Item 4, Post-Test on Reading Comprehension)

When another old cave is discovered in the South of France, it is not usually news. Rather, it is an ordinary event. Such discoveries are so frequent these days that hardly anybody pays heed to them. However, when the Lascaux cave complex was discovered in 1940, the world was amazed. Painted directly on its walls were hundreds of scenes showing how people lived thousands of years ago. The scenes show people hunting animals, such as bison or wild cats. Other images **depict** birds and, most noticeably, horses, which appear in more than 300 wall images, by far outnumbering all other animals.

4. In line 6, the word 'depict' is closest in meaning to …………………

a. Show

b. Hunt

c. Count

d. Draw

To infer the meaning of "depict", the students might have connected the ideas conveyed in the

sentence "Other images depicted birds and, most noticeably, horse, which appear in more than

300 wall images, by far outnumbering all other animals" and built up a semantic network.

After constructing the semantic network, although the students did not know the definition of

the word "depict", they might have formed a notion about its meaning based on the

surrounding words: it could be close to exhibiting or displaying objects, animals, or landscape.

The students might also have argued that "images" could not "hunt", "count" or "draw"

because these actions would be done by a person, not an object. For instance, it was more

appropriate to say "Somebody draws an image" rather than "An image draws somebody."

Hence, of the four given options, option A – "Show" – seems the best word to connect "other

images" and the rest of the sentence.

Similarly, test item 9 of the post-test on reading comprehension was designed to test the

students' ability to guess the meaning of unfamiliar words. As shown in Figure 4.16, this test

item was a multiple-choice question suggesting four options.

Figure 4. 16: *A Test Item in the Reading Comprehension Test* (Item 9, Post-Test on Reading

Comprehension)

> 9. What does "twin" (line 1) mean?
> a. People being born at the same time by the same parents
> b. People studying in the same university
> c. People living in the same area
> d. People writing emails to each other

Information from paragraph 6 (see Figure 4.14 for full text) synthesises the clues proving that

Tamara and Andriana were "twin" sisters. In paragraph 6, the phrase "same birthday" means

"people being born at the same time" and "both of them were from Mexico" might be closely

related to "People being born … by the same parents." This information might lead students to option A – "People being born at the same time by the same parents."

This study has focused on the development of the participating students' conceptual understanding based on the semantic relationship between the concepts on the texts and the relationship between textual context and students' prior knowledge and experience. Analysis of the concept maps, students' learning journals and interviews suggests that the students used key concepts in the text as "scheme activators" to activate their prior knowledge or experience about the text topic. Based on the activated schemata, they could guess the meanings of the unknown words. The activated schemata thus helped them generate notions about the meanings of the unknown words that fit in the semantic model created by the textual context.

Interestingly, the data also revealed that the students created an intersection between familiar and unknown words; they formed notions about an unfamiliar word without knowing the exact definition of the word. These findings accord with those of Khoshsima and Saed (2015); Tafazoli et al. (2017); Usman et al. (2017), all of whom claimed that contextualisation can help students expand the intersection between their prior knowledge and new knowledge. From a constructivist perspective, the students were constructing new knowledge through a process of assimilation (Seel, 2012) when they were able to contextualise a word and guess its meaning based on textual cues and their prior knowledge. Their notions of a word's meaning might be close to its dictionary definition. To this extent, the assimilation process is embedded in the contextualisation process.

As presented in Chapter 3 (section 3.4) and mentioned earlier in this chapter, seven reading texts of the reading course were selected from the book *English File* (Latham-Koenig et al., 2012), which was the official textbook for the English 1 module delivered to all first-year English non-majored students at the site university. This module aimed at helping students

develop skills in grammar, vocabulary, listening, writing, speaking, and reading. In terms of reading comprehension, the teaching outline proposed that the course develop students' abilities to skim for main ideas, scan for specific information, and guess unfamiliar words based on familiar ones. This study found that during the reading course, the students who used CCMAL for reading developed all these skills, while those who were exposed to traditional approaches developed only skimming and scanning skills. Students in the CG were found to struggle with guessing the meaning of unknown words. This suggests that CCMAL could be an effective learning tool in reading comprehension classes designed to achieve the university's targets.

As discussed earlier, CCMAL helped the EG students improve their vocabulary knowledge by inferring unknown words in the text through contextualisation. It is important to remember that vocabulary was not specifically taught in the reading course. Rather, the reading course focused on teaching these students concept mapping skills in addition to course-specific content. However, the observed increase in their contextualisation of unfamiliar words cannot be explained by just their engagement with the course material. Instead, the process of constructing the self-explanation maps, which required identifying key concept words and linking words, facilitated their contextualisation and assimilation of new words. According to Wilkins (1972), "While without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (p. 111). The knowledge of vocabulary and the ability to access that knowledge efficiently are recognised as essential factors in reading comprehension (Sidek & Rahim, 2015). Although the EG students' increase in vocabulary knowledge was a biproduct of this study, it was important in facilitating their reading comprehension.

The analyses of the students' concept maps and reading comprehension tests reveal that their text comprehension developed significantly due to concept map construction activity. This is evident in the improvement of their test scores on reading comprehension. Before the reading

course, the EG students' average score on reading was M = 5.30 (N = 50) and after the reading course their mean score on reading comprehension was M = 6.95 (N = 44). The P value at .04 < .05 indicates a significant improvement in EG students' scores on reading comprehension before and after the exposure of CCMAL. On a weekly basis, these students were asked to read a text about a specific topic and construct a concept map based on how they comprehended that text. The difficulty of the reading texts ascended in terms of length, vocabulary, and grammar between weeks 1 and 7. According to the site university's teaching guidelines, the reading texts from weeks 1 to 4 were 200 to 250 words long and included from five to eight new words; reading texts from weeks 5 to 7 were 250 to 300 words long and included more than eight new words. In terms of grammar and structure, reading texts from weeks 1 to 4 were in the present tense, including present simple tense and present continuous tense, while reading texts from weeks 5 to 7 combined both present tense and past tense.

The Cmap tools used as the interventional software in the current study provided these novice mappers with scaffolds such as available nodes, links, and map patterns and hence facilitated their concept map construction by reducing their cognitive load. The use of computational concept mapping in the design of this study is consistent with that of Oliver's (2009) study of high school students. However, its results do not align with Oliver's finding that high school students were moderately successful at "fill-in-the-map" activities but struggled to construct concept maps based on scientific texts. The students in the current study were familiar in their daily lives with the topics of the reading texts used; hence, it is possible that their prior knowledge about these topics facilitated their text comprehension and concept map construction (Al-Shumaimeri, 2006; Alfaki & Siddiek, 2013). In contrast, it is likely to have been challenging for the less-educated high school students in Oliver's (2009) study to comprehend their scientific texts without much prior knowledge.

Dorkchandra (2010) has claimed that reading topics that are of specific areas and unfamiliar to students (e.g., archaeology, mathematics, biology, etc.) might hinder their understanding, as they might not be able to use their prior knowledge and experience to infer the information from the text. In summary, the topics of the reading texts could have influenced the concept mapping of the EG students in this study. This will be discussed in more depth in Chapter 6.

4.5 Chapter conclusion

This chapter presented and discussed the findings related to Research Question 1. The students in both the EG and the CG improved their reading comprehension after the reading course. However, the comprehension scores of the EG students were better than those of the CG students. The EG students' achievement in reading comprehension scores was found to be correlated with and predicted by their scores on CM3. This means that the use of CCMAL had a positive influence on these students' reading comprehension during the reading course.

The research also found that due to the exposure of CCMAL, these students developed various concept mapping skills at three different comprehension levels (literal, interpretive and inferential level). These skills included identifying specific information, the main ideas, and the connecting ideas. In addition, CCMAL facilitated the students' ability to contextualise words. Concept maps, as the node-link diagram showing the semantic relationships among concepts, work based on Assimilation theories (Ausubel et al., 1978; Seel, 2012). By arranging concepts on the map, the students could guess an unfamiliar concept based on its relationships with other concepts that were familiar to them. During this process, the students were able to construct the meanings of the words based on notions about them. This illustrates that the assimilation process is embedded in the contextualisation process.

Chapter 5 explains how CCMAL influenced the EG students' metacognition in the reading comprehension classes. It also presents the ways these students used CCMAL as a metacognitive tool in their classes.

CHAPTER 5: THE INFLUENCE OF CCMAL ON STUDENTS' METACOGNITION

5.1 Introduction

Chapter 4 reported that computational concept mapping situated in an authentic learning context (CCMAL) had a positive influence on the participating students' reading comprehension scores and, correspondingly, they developed different levels of literal, interpretive, and inferential reading comprehension skills. Reading comprehension and metacognition have a mutual relationship, as the students who had higher levels of metacognition were reported to achieve better reading comprehension scores and, vice versa, competent readers tended to use more metacognitive strategies while comprehending a text (Martinez, 2006; Soto et al., 2019). This chapter presents the influence of CCMAL on the students' metacognition and their use of metacognitive strategies.

As presented in Chapter 2, metacognition is defined as the "awareness and management of one's own thought" (Kuhn & Dean, 2004, p. 270). This study aimed at identifying the influence of CCMAL on students' use of cognitive management because, compared with cognitive awareness, cognitive management is generally more crucial and observable (Lai, 2011). This study was based on the metacognitive framework developed by Channa et al. (2015) for reading comprehension contexts (see Chapter 2, section 2.2). This framework includes planning, monitoring and evaluation strategies that are relevant to three phases of reading comprehension: pre-reading, while-reading, and post-reading.

In Channa et al.'s (2015) metacognitive model, planning strategies include setting goals, anticipating the text content based on textual and visual clues; dividing time; and reading carefully the inquiries for a finer text cognisance. Monitoring strategies include thinking aloud, self-questioning, and regulated learning. For a more comprehensive understanding of the studied phenomena, Zimmerman's (2009) model for self-regulated learning strategies was

adopted because it has a strong basis in metacognition (Panadero, 2017). The self-regulated learning strategies include self-instruction, imagery, time management, environmental structuring, help-seeking, interest incentives, and self-consequences. The evaluation strategies involve reviewing goals; evaluating the accuracy in reading and credibility in comprehension; evaluating the appropriateness of reading materials; reflecting personal attachment with text for enjoyment; and assessing self-progress in reading.

This chapter incorporates research findings from both the quantitative data (reading comprehension tests, and survey questionnaires) and qualitative data (interviews, learning journals, students' concept maps, and observation field notes). Section 5.2 provides information related to the influence of CCMAL on students' metacognition and section 5.3 presents how CCMAL influenced students' use of metacognitive strategies. The research findings are discussed more fully in the context of previous literature in section 5.4.

5.2 Quantitative evidence for the influence of CCMAL on student's metacognition

To address research question 1, which was to investigate the influence of CCMAL on students' metacognition, quantitative data from the pre- and post-survey questionnaires on metacognition were analysed. The questionnaires focused on three components of metacognition: planning, monitoring, and evaluation.

The descriptive analysis showed that the mean scores on the pre-survey on metacognition of Experimental group (EG) and Control group (CG) were M = 3.31 and M = 3.35, respectively. The mean difference between these two values was relatively small at 0.04 (p = 0.74 > 0.05), indicating no significant differences between the two groups' average scores before the reading course. Table 5.1 displays the metacognition scores of the participants of both groups before the reading course.

Table 5. 1: Means and Standard Deviation of Pre- and Post-Survey on Metacognition by EG and CG

Group	*N*	*M*	*SD*	Mean Difference	*P*
EG	50	3.31	.61	0.39	.74
CG	50	3.35	.55		

*denotes statistical significance at p<.05

After the reading course, changes were observed in both the EG and the CG students' scores on metacognition. Table 5.2 presents these scores on metacognition before and after the reading course.

Table 5. 2: Means and Standard Deviation of the Pre- and Post-Survey on Metacognition of EG and CG

Group	Pre-test Metacognition			Post-test Metacognition			Mean Difference	*P*
	N	*M*	*SD*	*N*	*M*	*SD*		
EG	50	3.31	.61	43	3.63	.37	0.37	.00*
CG	50	3.35	.55	46	3.58	.25	0.20	.06

*denotes statistical significance at p<.05

Table 5.2 shows that the EG students' mean scores on metacognition increased from M = 3.31 (N = 50) at the beginning of the reading course to M = 3.63 (N = 43) at the end of the reading course, making the mean difference of .37. Paired samples t-test analysis was used to test the differences in the EG students' results of the pre- and post-surveys on metacognition. The results show that the EG students' score on metacognition before and after the reading course

was statistically significant at p value = .00 < .05. This implies that CCMAL had a positive influence on the students' metacognition.

Meanwhile, the CG students' mean difference on mean scores on metacognition before and after the reading course was .20 and p at .06 > .05, indicating no significant differences between their pre- and post-survey mean scores on metacognition (Table 5.2). This suggests that by having exposure to CCMAL, the EG students experienced more improvement in metacognition than those without exposure.

To identify whether the students' improvement in metacognition was related to CCMAL, a correlation analysis was performed between their scores on metacognition and their scores on concept maps collected in week 1 (CM1), week 4 (CM2) and week 7 (CM3). Table 5.3 presents the correlations between the EG students' scores on metacognition and their results on the concept maps. The analysis shows that before the reading courses, the students' scores on metacognition were not correlated to their scores on concept maps (CM1) at p = .89 > .05. After being exposed to CCMAL, their scores on metacognition were significantly and positively correlated to their concept mapping skills (p = .01 and .00 < .05) (see Table 5.3). This suggests that when the students' scores on the concept maps improved, their scores on metacognition also improved.

Table 5. 3: Correlations Between EG Students' Scores on Metacognition and Concept Maps

Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*
1. Pre-survey metacognition	3.31	.61	-				
2. Post-survey metacognition	3.63	.37	.89	-			
3. CM1	6.68	1.52	.70	.89	-		
4. CM2	7.68	1.28	.59	.01*	.27	-	
5. CM3	10.13	1.66	.59	.00**	.45	.13	-

*. Correlation is significant at the .05 level (2-tailed)

**. Correlation is significant at the .01 level (2-tailed)

Given that the correlation analysis revealed a significant and a positive relationship between the EG students' metacognition scores and their scores of concept maps, a multiple regression analysis was performed to examine whether scores of concept maps could predict scores on metacognition. A multiple regression using the enter method to predict the EG students' scores on metacognition from their scores on CM2 and CM3 was used because there was no presumption of which independent variables would create a better prediction equation. In this method, all the independent variables were entered into the equation at the same time. Table 5.4 shows that the independent variables predicted the students' metacognition, $F(2, 12) = 10.42$, $p < .05$. $R^2 = .64$, indicating that 64% of the variability of their scores on metacognition could be predicted by their scores on concept maps constructed in weeks 4 and 7.

The analysis shows that the students' scores on CM2 did not significantly predict their metacognition at $p = .41 > .05$, however their scores on CM3 significantly predicted their

metacognition at p = .01 < .05. A stepwise regression also indicated that only CM3 predicted their scores on metacognition. This implies that the more exposure to concept mapping the students had, the more CCMAL influenced their metacognition.

Table 5. 4: Regression Model Summary for Concept Maps and Metacognition

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.80	.64	.57	.30
a. Predictors: (Constant), CM3, CM2				
b. Dependent Variable: Metacognition				

As presented in Chapter 2, the regulation of cognition includes planning, monitoring and evaluation strategies. Hence, a paired sample t–test was run to identify the influence of CCMAL on these metacognitive components.

Table 5.5 shows a significant difference in the EG students' mean scores on monitoring and evaluation in the pre- and post-surveys on metacognition at p = .00 > .05 and p = .00 > .05 respectively. However, there were no significant differences in their mean scores on planning before and after the reading course at p = .16 > .05. Interestingly, the students' scores on evaluation increased the most, followed by monitoring and planning. Before the reading course, the EG students' mean score on evaluation was M = 3.22. After the reading course, their mean score on evaluation was M = 3.73, making up the mean difference on evaluation at .51, which is larger than that on planning and monitoring at .17 and .45, respectively. The p value at .00 indicates a significant difference in the EG students' mean scores on evaluation

before and after their exposure to CCMAL. These results imply that CCMAL had the largest

influence on evaluation, followed by monitoring. However, the evidence for the influence of

CCMAL on planning was not obvious.

Table 5. 5: Mean Scores and Standard Deviation of Metacognitive Components

Metacognitive Components		Pre-test		Post-test		Mean Difference	P value
		Mean	*SD*	Mean	*SD*		
1	Planning	3.29	.67	-	-	.17	.16
	Post-Planning	-	-	3.46	.56		
2	Monitoring	3.27	.66	-	-	.45	.00*
	Post-Monitoring	-	-	3.72	.54		
3	Evaluation	3.22	.67	-	-	.51	.00*
	Post-Evaluation	-	-	3.73	.71		

*denote a statistic significant of p < .05

In short, the quantitative data indicates that as a learning strategy CCMAL positively

influenced the students' metacognition and had a greater influence on their evaluation and

monitoring strategies than their planning strategies. These findings were triangulated with the

qualitative findings in the discussion section of this chapter to provide in-depth information

about the students' use of metacognitive strategies during the reading course.

5.3 Qualitative evidence for the influence of CCMAL on students' metacognition

As discussed in the literature review chapter (Chapter 2), metacognition has two constituent

parts: knowledge about cognition, and management of cognition (Flavell, 1979; Kuhn & Dean,

2004; Lai, 2011) (see section 2.4). However, in the current study, the focus was mainly on

management of cognition, as it is more crucial and observable (Lai, 2011). This aligns with Young and Fry's (2008) claim that students' management of cognition is their actual use of metacognitive strategies in learning and thus has direct influence on their academic achievements.

As presented in Chapter 3, the pre- and post-surveys on metacognition, which included 13 items, were designed to measure the students' metacognition before and after the reading course. This survey covered three components of cognitive management (planning, monitoring, and evaluation). At the same time, Channa et al.'s (2015) metacognitive model was used for interpreting the qualitative data related to the metacognitive strategies that students used during the reading course. Although the pre- and post-surveys did not cover all the metacognitive strategies included in Channa et al.'s (2015) model, they helped to assess the students' metacognition regarding planning, monitoring, and evaluation.

It was observed that the students used only some of the metacognitive strategies in Channa et al.'s (2015) framework. One of these was anticipating the text content based on clues from the text such as the title or photos. Monitoring strategies included thinking aloud, self-questioning, imagery, and help-seeking. Evaluation strategies included assessing the students' academic progress during the reading course.

5.3.1 The influence of CCMAL on students' Planning: Anticipation

According to Grabe (2009), reading comprehension involves three steps: pre-reading, while-reading, and post-reading. "Generally, a reading lesson has three major stages: a pre-reading stage; a while-reading stage and a post-reading stage" Ibrakhimovna (2016, p. 45). Hence, planning activities at the pre-reading phase helped the students prepare for the other phases of reading comprehension.

During observations of experimental group, the researcher noticed that the students anticipated the content of the text before comprehending it. This strategy was predominantly used in week 3 when there were photos attached to the reading text. The observation field notes in week 3 reveal:

> *Before constructing the concept map, the teacher gave students a focus question which asked students about the main theme of the text. To answer this question, students had to make predictions about the text content before reading it. I saw that students tried to use different ways to guess the content of the text. Some students looked at the text title while some other students looked at the photos in the textbook. After that, the teacher picked one student to ask him about the main theme of the text. The student said: "I think the topic of the concept map should be "Music" because this word starts the title of the text". Then the teacher asked another student to comment on the other student's answer. This student said: "I think the text is about "Music", too. Because I saw people playing music in the photos."* (Observation field notes, Week 3)

The title of the text of week 3 is "Music is changing their lives." Two photographs were attached to the reading text, one showing a conductor with a baton in his hand and the other showing people with musical instruments.

Data from the students' learning journals in week 3 also reveal that they had anticipated the text content before starting to construct the concept map. One student reported:

> *My teacher asked us to find out the topic for our concept map. The title of the text began with the word "Music", it told me that this text could be about music. I also saw a musical key note before the title of the text, so I thought that it should be about music.* (Thuy Dung, Learning Journals, EG, Week 3)

Thuy Dung had predicted the text content based on both the textual and visual clues. She used the title "Music is changing their lives" as the textual clue to guess the text's main theme. In addition, the symbol of the musical note attached to the title of the text led her to predict that the text content must be related to music.

Another student also presented details of his predictions about the text content in his learning journals:

> *It was not difficult to guess the topic of today's text. I saw men and women in nice clothes, they were holding violins in their hands. I thought they were in the concert. I saw this on TV before.*

So, the topic of my concept map could be about classical music. (Manh Tien, Learning Journals, Week 3, EG)

In this excerpt, Manh Tien seemed to involve his prior experience in making predictions of the text content. He claimed he had previously seen something similar to the photo that illustrated the text. Therefore, his predictions of the text content were relatively detailed. Not only did he identify the general theme of the text, which was about music, he related what he had seen to a specific type of concert music (classical music).

The observation field notes in week 7 similarly reported that the students could predict the text content by looking at both textual and visual clues from the text. The following excerpt is from the observation field notes in week 7:

> *The teacher started the concept mapping process by asking student the question "What is the topic of the text?" and pointed to some students to answer this question. A student said: "I think the text is about food because I saw the word 'ate' in the title. 'Eating' is often related to 'food'". Another student said: "The title told me that the text could be about something related to food. I also saw three people in the photos, maybe the text is about the food of these people ate".*
> (Observation field notes, week 7)

The observation field notes in week 7 revealed two student's answers to the teacher's question, "What is the topic of the text?" reveal that they predicted the text content based on both its title of the text and the photos illustrating it. The title of the week 7 reading text was "What they ate yesterday." This title might have led to one student's prediction that the text must be about something related to food. Notably, the other student's answer revealed that he combined both textual and visual clues to anticipate the text content. The reading text included three paragraphs, with a photo illustration for each paragraph (refer to Figure 4.9). These photos were of two women and a man. This student synthesised the information from both the title and the photos to predict that the text could be about the food that these three people ate.

The students' interviews also suggest that concept mapping helped them anticipate the text content. Three students mentioned this metacognitive strategy when they described their concept mapping. Le Xuan said:

> *Before we constructed the concept map, our teacher often asked us about the topic of text. The only way to answer her question before reading the text was to make guesses. I often read the title of the text because it normally told what the text was about. I sometimes looked at the photos, too but not as often as reading the title.* (Le Xuan, Interviews)

Generally, this study has found that the use of CCMAL enhanced students' text content anticipation. The students predicted the text content based on both textual clues (titles, sub-titles) and visual clues (photos). As a planning strategy, text content anticipation helped the students gain a better initial understanding of the text, thus facilitating their concept map construction. Interestingly, their use of such strategies was more prominent when there were more photographs attached to the reading text (e.g., Weeks 3 and 7). Visual aids such as photographs could have been the stimuli for the students' predictions as these could have activated their prior knowledge and enabled them to predict what they were to read and thus to comprehend and enjoy what they had read. To this extent, predicting brought potential meaning.

5.3.2 The influence of CCMAL on students' Monitoring strategies

According to Channa et al. (2015), students use monitoring strategies during the while-reading phase. These are crucial to ensuring that students understand the text accurately. Monitoring strategies include thinking aloud, self-questioning, self-regulating, imagery, and help-seeking.

5.3.2.1 Thinking aloud and Self-questioning

Data from students' learning journals and interviews suggest that CCMAL might have encouraged students' use of the thinking-aloud strategy. Thinking aloud refers to the articulation of the internal thinking the students would have deployed when engaging in

literacy practices (Fisher et al., 2011). From their learning journals, it was apparent that the students used the thinking-aloud strategy during CCMAL. In more than a half of the collected learning journals (12 out of 21), students believed that during concept map construction they used thinking aloud for better problem solving and decision making. One student revealed:

> *The concept map was about food. I selected some concepts from the text such as "vegetarian", "restaurant", "meals", "breakfast", "lunch", "dinner" and "energy". I also wanted to use some other words from outside the text such as "health", "industry" because I think these words are related to the topic of the text. But I wasn't sure about how to connect these words to other words in the map. When I was confused or hesitant about something, I said aloud to explain to myself how I should arrange the words together on the maps. I had to make all the decision on my concept map by myself such as what concept to put on the map, how these concepts are connected, how to arrange these concepts. I felt that when I spoke aloud, my thoughts became clearer, and I could make better decisions for the map.* (Thu Ha, Learning Journals, EG, Week 7)

Thinking aloud helped Thu Ha with problem solving and decision making while she was concept mapping. By constructing the concept map, she had to make her own decisions related to selecting appropriate concepts, identifying the relationship between them, arranging them on the map, etc. She also revealed that through thinking aloud, her thoughts became clearer, and hence she was able to solve the problems better.

In the interviews, four students reported that they used the thinking-aloud strategy during their concept map construction. One of these was again Thu Ha:

> *I often talked to my self what I was building the concept map. When I thought about something, it was in my head and when I talked a loud to myself, my thought was repeated one more time in my words and this made my thinking flow clearer to me. I often to talk to myself when I had to make decisions for my own concept map. Sometimes, I wasn't sure how to solve a problem while concept mapping, I talked aloud what my options were and the reasons for each option. I also explained to myself which option was the best. Talking a loud was really helpful to me because it helped me make better decisions for the concept map.* (Thu Ha, Interviews)

Here, Thu Ha spoke about how by thinking aloud repeatedly her ideas become more explicit. According to Raihan (2011), metacognitive strategies such as thinking aloud can help students to unfold hidden thoughts, and thus, by verbalising their thoughts, self-regulated students can reinforce their higher order thinking using metacognitive processes. By restating their problems

to themselves, the solutions they reach and the justifications for those solutions support their decision making.

During concept map construction, the students had to make many decisions about which concepts to include the relationships between the concepts, and the overall presentation of their concept maps. In order to make good decisions, students had to synthesise and compare information. Verbalising their thinking made their cognitive processes explicit and allowed them to solve their problems. Concept mapping thus appeared effective for helping students with problem solving through encouraging them to think aloud.

While some students were able to make decisions through thinking aloud, others reported that they could summarise the text by vocalising their thoughts. Data were collected from five students' learning journals and three students' interviews. The following two excerpts from Hai Chau are representative:

> *Our teacher allowed us to do [concept mapping] in our own ways. So, I guess my classmates might have different ways to build their concept maps. For me, I often summarised the text before starting with the concept map. My summary was in spoken way because I found it more useful for me.* (Hai Chau, Interviews)

> *Before I built a concept map, I read the reading text about Food. Then, I summarised the reading text in my word. I retold myself how I understood about the text to help me build the best overview of its content. I found that the text talked about the food that three people ate. And then, I picked up some important concepts from the text to put on the map: food, health, activities, vegetables, meat, meals, drinks, models, writer and boxer. After that, I tried to arrange these concepts on the maps according to my summary.* (Hai Chau, Learning Journals, EG, Week 7)

Data from the student's learning journals and interviews show consistently that they summarised the text before constructing concept maps, and that thinking aloud was useful for summarising the text content. As part of the process of understanding the text, they used thinking-aloud to summarise its content and identify its main ideas.

In week 7, it was observed that the students thought aloud while constructing their concept maps for the purpose of reasoning. The observation field notes in week 7 reported:

During concept map construction, the teacher walked around the classroom to help students with their maps…The teacher looked at one student's concept map and ask: "Why did you put 'Fast food was not good for health?' in your concept map". The student answered: "I was thinking that like because James didn't eat fast food. And he was going to have an important fight soon, he would want to eat things that was good for his health like what his mother cooked for him. I just thought that fast food was not good for health because it was not in his diet." (Observation field notes, week 7)

In this conversation with the teacher, the student articulated his thoughts about concept mapping. In his concept map he presented his arguments about the proposition "Fast food is not good for health" based on his understanding of the text content. By speaking his thoughts aloud, was able to explain his concept mapping decisions to the teacher.

A similar pattern was found in the students' learning journals. They used the thinking-aloud strategy to present their arguments. One student reported:

When I was building my concept map about Food, I explained to myself why I included the specific ideas in the map. For example, I put the idea "Lionel did not have a good eating habit" on the concept map because she did not have any food for breakfast and skipped lunch. (Quynh Thu, Learning Journals, EG, Week 7)

Quynh Thu revealed that she self-explained her decisions during concept mapping. She took a proposition from her concept map as an example of how she thought aloud for reasoning. She believed that Lionel, one of the three people whose eating habits were described in the week 7 text, did not have a healthy eating habit because this person had only coffee for breakfast and no lunch.

In general, data from the students' learning journals, the interviews, and the classroom observations offer strong evidence for the positive influence of CCMAL on the students' use of the thinking-aloud strategy. Thinking aloud helped the students develop the ability to monitor their reading comprehension and employ strategies to guide or facilitate understanding. The students were found to use thinking aloud for various purposes, such as decision making, summarising the text, and presenting arguments.

Wilson and Smetana (2011) analysed the protocols of thinking aloud during reading comprehension and claimed that thinking aloud can involve self-questioning as students vocalise the questions to themselves while learning. In this study, data from the students' learning journals suggest that they combined thinking aloud and self-questioning for concept map construction. Some students claimed that they talked aloud to themselves about the questions they had while concept mapping. For example, Khanh Huyen wrote:

> *To start concept mapping, the teacher asked us to read a text about Food and answer the question "What do you understand about the text?". I tried to answer this question by answering a set of smaller questions related to that big one such as "What is the first paragraph about?", "Why didn't James eat fast food?" or "What was special about Laura's breakfast?". I sometimes spoke aloud to myself the questions I wanted to answer. When I had specific questions to answer, I was more attentive to the reading process. I also try to read the text again and again until I could answer those questions.* (Khanh Huyen, Learning Journals, EG, Week 7)

Khanh Huyen reported that she had a set of questions for herself when she was reading the text. Through self-questioning, she was able to focus better on the text and clarify her thoughts. In her interview, Khanh Huyen restated that she used both thinking aloud and self-questioning for text comprehension and concept map construction:

> *I started concept mapping by reading the text. While reading the text, I kept asking myself what words to select for the map, how to connect the words, how to arrange the map. Talking out loud these questions made me focus on concept mapping while reading the text.* (Khanh Huyen, Interviews)

Khanh Huyen said that she had a set of concept mapping-related questions for herself while reading the text. These questions included what concepts should be selected for the map and how the concepts should be arranged and connected on the map. She said that asking herself these questions aloud helped her stay focused on concept mapping while reading the text.

Such comments are consistent with the information provided by other students in their learning journals. For example, Thuy Dung wrote:

> *I was asking myself "Why didn't James eat fast food?", "Where did Laura have dinner?" or "Did Lionel have lunch yesterday? Answering these questions made me understand the text*

better and I could build my concept map more easily if I had better understanding of the text.
(Thuy Dung, Learning Journals, EG, Week 7)

Thuy Dung had asked herself questions in order to interpret the stories conveyed in the text.

Self-answering helped her understand the text better.

Other students also reported that self-questioning helped them stay focused on the text and

enhanced their interaction with it. The following excerpt is from Duong Hien's learning

journal:

> *The teacher asked us to build the concept map about Food. Because there were no fixed samples to follow, I asked myself lots of questions. I asked myself questions like "What is the connection between "wine" and "health"?", "Should I involve some words from outside the text such as "calorie" or "protein"?", "Does the proposition "fast food is not good for health" fit the content of the text? I kept asking myself these questions because I wanted to make sure that I kept paying attention to the things I knew and was not sure. To answer my questions, I had to spend more time reading the text carefully. I felt more confident with my concept mapping when I asked myself questions and addressed them during the* (concept mapping – researcher) *process.*
> (Duong Hien, Learning Journals, EG, week 7)

Duong Hien reported that concept map construction was a self-determining process as the

concept maps were her own works and she did not have to follow any fixed rules for

constructing them. As a result, she had many concept mapping related questions to ask herself

because she wanted to be aware of what she knew and of what she was less sure about. Self-

questioning thus helped her focus on reading comprehension.

Consistent with the data from the learning journals, the students reported in their interviews

that they asked themselves questions while reading the text and concept mapping. The

following two excerpts are interview responses:

> *I did ask myself lots of questions. "What is the text telling?", "How do the ideas relate to each other?", "What concepts could tell the story the best?" ... I tried to answer these questions to understand the text better and to do better concept mapping.*
> Researcher: *Can you tell me a bit more about this?*
> *– I think the concept maps would be better if I had better understanding of the text.* (Thuy Dung, Interviews)

> *Asking myself questions did make me understand the text more deeply. I was like "Why?" and "How?" all the time. Questions made me work harder but more attentively. I remember that in*

week 7, I was asking myself "Why was Laura's breakfast unusual?". I tried to pay more attention to the paragraph about Laura's breakfast and found that she had both tea and coffee for breakfast. This was unusual because people usually had either tea or coffee, not both for breakfast. (Duong Hien, Interviews)

Both Thuy Dung and Duong Hien said that self-questioning was useful in concept mapping. Thuy Dung mentioned that self-questioning helped her understand the text better and thus construct better concept maps. Duong Hien revealed that verbalising the questions to herself helped her stay focused on the text.

As the observation field notes in week 7 reveal, some students muttered or spoke aloud while concept mapping:

> *I noticed that some of the students were muttering something while they were constructing their concept maps. One of these students raised his hand and said to the teacher: "Teacher, I was wondering why Laura never ate meat, can I relate this idea to her health or to her habit?"*
> (Observation field notes, EG, Week 7)

While the observational evidence of students engaging in self-questioning while thinking aloud is relatively weak, it was through the learning journals and interviews that the researcher found evidence of students combining self-questioning with the thinking-aloud strategy.

As a metacognitive strategy for reading comprehension, self-questioning was found to help students better understand the text, maintain their focus on reading comprehension tasks, and enhance their interaction with the text. It is interesting to note that the students seemed to know what questions to ask themselves in order to clarify their thoughts. This could be an important step toward reading comprehension. Nevertheless, the classroom observation does not provide compelling evidence for the consistency of these patterns. This limitation is acknowledged and discussed further in Chapter 7.

5.3.2.1 Imagery

According to Atoum and Reziq (2018), imagery is defined as the "ability to represent events and stimuli" (p. 13). Mental imagery influences students' perception of different situations,

experiences and events, as it constitutes the main part of the cognition process. Therefore, it influences the process of reading comprehension related to the ability to absorb texts and to understand the different relationships between events.

Data from the EG students' learning journals and interviews show that CCMAL enabled their imagination. Nearly half of the EG students' learning journals (10 out of 21) mentioned this as a useful strategy in the while-reading phase. One student described her imagination process as follows:

> *My imagination has improved a lot since I used concept mapping for reading comprehension. Different words in the text aroused in my mind different images. Then I tried to connect these images to understand the text better.* (Hai Chau, Learning Journals, Week 4, EG)

In the context of this study, although the students used the phrase "sự tưởng tượng", which means "imagination", in their learning journals and interviews, it seemed to be more about imagery because the students referred to it in terms of mental images of things, events or people. Hence, "imagery" will be used hereafter instead of "imagination" to refer to the reading comprehension strategy that was triggered by engaging in CCMAL.

There was evidence of the students' progressive use of imagery in their concept maps. Although their concept maps were collected in weeks 1, 4 and 7 of the reading course, no evidence for students' use of imagery were found in the concept maps collected in week 1. In week 4, students were asked to construct a concept map based on the reading text about "Long lives" (refer to Figure 4.5). This described the living conditions and daily habits of long-lived people in different parts of the world. Figure 5.1 is one student's concept map.

Figure 5. 1: *A Concept Map Constructed by an EG Student* (Hoang Tung, Week 4)
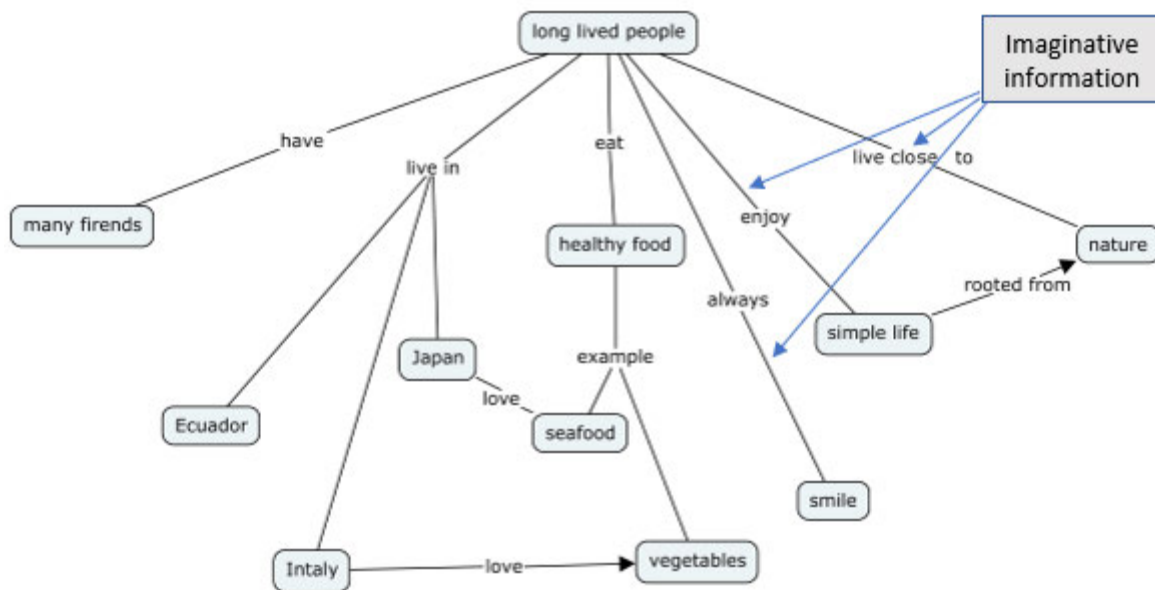
Figure 5.1 shows that most of the propositions conveyed the ideas from the reading text.

However, Hoang Tung also included some propositions that were not directly mentioned in the

text, such as "Long-lived people always smile", "Long-lived people enjoy simple life", and

"Long-lived people live close to nature." Although the proposition "Long-lived people live

close to nature" was not conveyed in the text, Hoang Tung might have included this

information on the map because he used imagery. Hoang Tung's image of the idea that long-

lived people lived close to the nature was based on other concepts in the text such as "fields",

"river", "mountain" and "animal". Each of these concepts might have evoked a mental image

in the mind about a specific part of nature. When all of these mental images were connected,

they would have built up a more comprehensive and broader image of "nature". Similarly, the

proposition "Long-lived people enjoy simple life" was created based on the Hoang Tung's

imagery of a "simple life". He might have defined a "simple life" as residing in a village,

having no stress, being happy, being positive or not being in a hurry, because the text described

the Vilcabamba people as living in a small village and working in the fields. In the paragraph

about the Ogliastra people, there is mention of a man who could not read but had no stress. The

last paragraph revealed the Okinawan people's secrets to a long life: being happy, being positive, and not being in a hurry. All these images might have helped Hoang Tung to build up a broader image of a "simple life".

In Hoang Tung's learning journals in week 4, he also revealed that imagery was used to enhance his text comprehension:

> *I often used the images in my mind to understand the texts better. I had different images in my mind about different words or ideas in the text. I just put these images together to form a bigger picture in my mind about the text content.* (Hoang Tung, Learning Journals, EG, Week 4)

Hoang Tung referred to visual representations of the text in his mind as "pictures" or "images". He also mentioned how CCMAL enabled his imagery while comprehending a text. Specifically, Hoang Tung created in his mind mental images or pictures that were then connected to form a more general image of the text content.

Another excerpt from Hoang Tung's learning journal further illustrates his imagery process:

> *I imagined the visual images in my mind about the content of the text from the visual images of key concepts. It was like creating an elephant from its trunk, its legs or tail. Each image of the concepts gave me a little bit of visual information about what the text was about.* (Hoang Tung, Learning Journals, EG, Week 7)

Hoang Tung consistently described the imagery process as the connecting and building process of a mental image of a more general idea from other mental images of more specific details. Imagery was useful in comprehending the text as it helped him think beyond the text and facilitated his ability to infer.

Data from the students' interviews show similar findings. Six out of the 12 students who participated in the interviews said that CCMAL helped them construct a broader understanding of concepts through mental imagery that carried more detailed information. For instance, Ha Nga and Ngoc Anh revealed that they created mental images to connect to and facilitate their text comprehension:

While reading the text, sometimes the concepts in the text could arouse in my mind the images. Afterwards, I could connect these images to help me understand the text better. (Ha Nga, Interviews)

An image of something just appeared in my mind when I read a concept. So, during my reading comprehension, many mental images were created in my brain. I linked these images to have bigger images about the text content. (Ngoc Anh, Interviews)

The following classroom observation field notes also supportive this finding:

In week 4, students' reading text was about the long-lived people in three different places: Vilcabamba, Ogliastra and Okinawa....The teacher asked a student why he involved "long-lived people eat healthy food" in his map. The student said: "The text says that long-lived people often eat vegetable and fruit. When I read these words, the images of different kinds of fruit and vegetable come to my mind and then made me think of the food pyramid. In the food pyramid, vegetables and fruit are the healthiest kinds. So I think that long-lived people eat healthy food". (Observation field notes, EG, Week 4)

These observation field notes describe a situation where a student was explaining his imagery to the teacher. The student formed mental images of the food that long-lived people might eat, namely, vegetables and fruit. Afterwards, the mental images of different types of vegetables and fruit were connected to his prior knowledge of the food pyramid, which lists vegetables and fruit among the healthiest types of food. Therefore, this student included in his concept map the proposition "Long-lived people eat healthy food".

Evidence for the students' imagery was also found in the post-test on reading comprehension. Test item 5, which was an open-ended question, required students to explain the reason that painting inside the Lascaux complex (a cave in France) would have been a difficult task for ancient people. The reading passage provided the students with a description of the Lascaux complex, which was a tall, narrow cave with walls containing many pictures of animals painted thousands of years ago.

The answers of some students demonstrated rich imagery. For example:

It was dangerous to crawl up high in a narrow cave because there was not much space for moving and steeps walls made people fall down easily. (Thu Trang, EG, Post-test)

Because Lascaux complex is narrow and tall and there were no tools to help ancient people reach the tall walls thousand years ago. (An An, EG, Post-test)

Thu Trang seemed to construct the picture of a dangerous situation when the ancient people crawled up on the "steep walls" in a "narrow space", whereas An An compared ancient people's tools with modern technologies: ancient people did not have ladders or steps to help them reach to the tall walls, which would have made their painting more dangerous.

Although thought processes may be nonverbal, verbal stimuli may activate nonverbal processes, and vice versa (Paivio, 2006; Sadosski & Paivio, 2013). To the extent that the students were able to create mental images based on textual information, concept mapping may have facilitated their comprehension by enabling their imagery. In the above excerpts, the written text was able to conjure imagery that helped to fill the gap in the written texts in order for students to make inferences from their prior knowledge. For instance, the student who was mentioned in the week 4observation field notes made use of his prior knowledge about the food pyramid to claim that long-lived people eat healthy food. Similarly, the students' answers for test item 5 of the post-test on reading comprehension show that it was possible that they had built up mental images based on their previous knowledge and experience. And when An An compared the ancient people's tools and modern tools to argue that climbing up to the top of the cave would have been dangerous without modern tools, he must have inferred this from his prior knowledge about modern tools that support climbing. In these cases, the use of imagery based on textual cues involved the students' prior knowledge in their reading comprehension process and allowed them to fill in the gaps of the written texts, thus facilitating their reading comprehension.

5.3.2.2 Help-seeking

As presented earlier, Channa et al.'s (2015) model of metacognitive strategies includes self-regulated strategies. Of the self-regulated strategies in Zimmerman's (2009) model, help-

seeking was considered important as it can be used as a fix-up strategy to help students resolve comprehension failures (see also Ryan et al. (2001)). From the classroom observations and the students' interviews and learning journals, this study found that the use of CCMAL positively influenced the participating students' use of help-seeking strategies.

The data show that the students tried to complete their reading and concept mapping tasks using various resources (teacher, peers and self-efforts). Through the classroom observations, the researcher noticed the different ways the students sought help when they had problems at the beginning and the end of the reading course. While they frequently sought the help of their teacher and their classmates at the beginning of the reading course, they tended to make more self-efforts by the end of it. The following observation field notes were made in weeks 1 and 7:

> *While constructing concept maps, students had many questions. Some students raised their hands to ask for their teacher's help and some other just asked around for the classmates' help. The teacher moved around the classroom to give them advice on concept map construction. I observed that many students asked for the teacher's help constantly. Some students even had to wait for the teacher to get back to them because she was too busy answering questions. I also observed that students asked for their classmates' help. I saw some students pointing to the reading text or their concept maps to their peers. I heard some students sitting close to me asked for their mates' help.* (Observation fieldnotes, Week 1)

> *While constructing the concept map, only a few students raised their hands to ask for the teacher's help. And a very few students turned around for their peers' help. Instead, they seemed to spend time thinking about the problems and solve the problems by themselves. Many students were seen to look at their concept maps intently and try to make changes to the maps.* (Observation field notes, Week 7)

At the beginning of the reading course, the students relied on their teacher's help or their peers' help for problems related to both concept mapping and text comprehension. However, by the end of the reading course they were spending more time trying to solve the problems by themselves. It is likely that CCMAL helped them become more aware of their work as they tried to build concept maps that best represented their understanding. Thus, they became more focused on using their own initiative to solve their concept mapping and reading comprehension issues, rather than asking for their teacher's help immediately.

Data from students' learning journals also suggest that the more they used concept mapping, the more they made their self-efforts in text comprehension and concept mapping, and the less they sought help from others (e.g., teacher, classmates). Khanh Huyen's learning journals in week 1 and week 7 revealed the following:

> *When I built my concept map, Whenever I had any problems, I thought of my teacher's help immediately. I think I have asked for her help many times so far. If I couldn't reach to the teacher, I would ask my classmates for help, too. It was so quick because they were just sitting next to me.* (Khanh Huyen, Learning Journals, EG, Week 1)

> *I still had a few problems when I built the concept map, but I preferred spending a little bit more time thinking about the problems and find out the solutions by myself. My main problem was vocabulary. But concept maps have been very useful because it helped me guess the meaning of the new words. So, I didn't ask my teacher many questions while reading the text. I think I can do it by myself and I only ask my teacher when the problem is way too hard for me.* (Khanh Huyen, Learning Journals, EG, Week 7)

Consistent with these excerpts, Khanh Huyen also said in her interview that she had sought help in the reading comprehension class:

> *Before, when I saw a word that was not familiar to me, I often asked my teacher immediately because it was quick and easy. But then, I found that when I arranged the map, I could guess some of the concepts. When I could do things by myself, I felt more independent.* (Khanh Huyen, Interviews)

Khanh Huyen revealed that in the beginning of the reading course, the teacher's help was the first thing she thought of when she encountered a problem because it was a quick and easy way to solve the problem. During the reading course, instead of asking for the teacher's help immediately, she would spend more time on the problem to solve it by herself. She also revealed that concept mapping was useful in solving vocabulary-related problems because insufficient vocabulary was her main shortcoming and concept mapping was an effective tool to contextualise new words. Thus, it may be seen that by learning through building concept maps, the students began to take ownership of their learning and became less reliant on seeking help from others. They moved from seeking external help to making efforts to resolve issues themselves during CCMAL. This gradual change in the ways the students resolved issues

highlights the positive influence of CCMAL, as it provided a flatform for students to clarify and externalise their thinking.

Interestingly, data from the interviews and learning journals suggest that towards the end of the reading course, students tended to engage in negotiation of meaning. In their learning journals, two students mentioned how they assisted each other and engaged in discussion:

> *I asked my classmates and they also asked me when we built the concept maps. We liked asking each other and discussing about what we were wondering. Especially when we had no ideas about the meaning of a word in the text, we tried to guess, discuss and explain to each other. It was very interesting.* (Quynh Thu, Learning Journals, EG, Week 7)

> *Concept mapping was a very good way to help me guess the meaning of new words. However, I was not sure about my guess because it was only a prediction anyways. I often asked my classmates' opinions because I wanted to compare my predictions and theirs. That was a good way because we could help each other.* (Hoang Tung, Learning journals, EG, Week 7)

It seemed that both Quynh Thu and Hoang Tung were more aware of their help-seeking strategies and became more active in their learning. Rather than relying on their peers' help, they actively offered help to other students or discussed issues with them. This indicates that concept mapping helped these students not only to learn but also to become more active in the learning process.

Data from the students' interviews show that after the reading course they became more engaged in learning by sharing their ideas with their peers. Hoang Tung said:

> *I have troubles with vocabulary, I try to fix this problem by ... asking ... my mates. We always asked each other for help during concept mapping. If one person knows a word, he will tell others sitting around. We sometimes compared our guesses about the unknown words and discussed. It's more fun than asking "Hey, tell me what X means?" and waiting till they could get back to me.* (Hoang Tung, Interviews)

The classroom observation field notes also indicate that some students became more involved in sharing ideas with their peers by the end of the reading course.

> *During the concept mapping, some students were observed to discuss about their concept maps in small groups, they looked at others' maps and use their fingers to point to the something on the map and discussed about it... In a group of students, a student suddenly turned to her peers and*

*asked, "Do you know what "energy" mean?". Another student said: "Is it like a kind of food?".
The other student suggested: "I think it's close to power". The student answered to her peers: "I
agree that it is something close to 'power' because Lionel said that a cup of coffee gave her
energy for the whole day, so 'energy' should be something like the power more than the kind of
food."* (Observation field notes, Week 7)

Through the duration of the reading course, it was observed that the students resumed a more

active role in learning. Instead of asking for the peers' help and taking their peers' answers

passively, they tended to actively share ideas with their peers and engage in meaning

negotiation. This shift from passive to active learning highlights how CCMAL could be an

important part of the journey for students learning reading comprehension.

As described in Chapter 2, there are two particular types of help-seeking: executive help-

seeking and instrumental help-seeking (Taplin et al., 2001). Executive help-seeking places the

responsibility on the helper to reduce the time and effort required to complete a task.

Instrumental help-seeking focuses on the responsibility of the help-seeker and allows for

greater independence in completing the task. For example, the students could have engaged in

instrumental help-seeking by finding the hints from discussions or just spending more time on

solving the problem by themselves. Researchers have found that instrumental help-seeking has

a positive influence on students' academic achievements, and executive help-seeking is

negatively related to academic achievement (Taplin et al., 2001; White, 2011). Taplin et al.

(2001) argued that it is necessary to encourage students to differentiate between the

instrumental help-seeking (along with its benefits) and executive help-seeking (along with its

avoidance of needed assistance), and to enhance their use of assistance that will facilitate

"long-term autonomy" (p. 58).

In the context of this study, CCMAL helped the students become more aware of their help-

seeking strategies and more active in learning. Rather than relying on the teacher's and peers'

help, they focused on making self-efforts for task completion. The students also became more

active in help-seeking by engaging themselves in group discussion instead of passively

accepting their peers' answers. They seemed to focus on executive help-seeking at the beginning of the reading course and instrumental help-seeking by the end of it. Thus, it can be said that CCMAL encouraged them to use instrumental help-seeking strategies, which would have enhanced their academic advancement.

5.3.3 The influence of CCMAL on students' evaluation: Self-progress

In reading comprehension classes, evaluation is considered to be a post-reading strategy that reveals how well students can summarise the core ideas for comprehension of certain material and find supplementary evidence for students' progresses (Schiff & Calif, 2004). Channa et al. (2015) proposed five evaluation strategies in reading comprehension: (1) evaluating the importance attained from the written manuscript, (2) evaluating the accuracy in reading and credibility in comprehension, (3) evaluating the appropriateness of material, (4) evaluating personal attachment with text for enjoyment, and (5) evaluating self-progress in reading. This study of students' use of CCMAL in reading comprehension found evidence for only the fifth strategy – evaluating self-progress.

Data from the students' interviews indicates that concept mapping was an effective tool for them to assess their own progress. Five out of 12 students reported that they used concept maps for evaluating their learning progress. Khanh Huyen said:

> *Concept maps helped me to evaluate my progress in reading ability. Because when I look at the concept map, I can tell how much I understand the reading text. So, I can compare my concept maps built in different weeks to see my progress in learning during the course.* (Khanh Huyen, Interviews)

Khanh Huyen said that by comparing her concepts maps, which were constructed at different times, she was able to evaluate her self-progress in reading comprehension because the concept maps were the representation of her text comprehension.

Likewise, data from the students' learning journals also suggest that they used concept maps as

a useful tool for assessing self-progress. Thu Trang reported:

> *I think that I have made some progress during this course. I found that my concept maps this week was better than those in the weeks before. I could put more concepts from the text on the concept map and the concepts were better connected.* (Thu Trang, Learning Journals, EG, Week 7)

Thu Trang wrote that she had evaluated her progress in reading by comparing her concept maps in week 7 with the concept maps constructed in the weeks before, and that she had assessed her concept maps based on the relationships between concepts on the map.

Analysis of three concept maps constructed by Le Xuan at three different times of the reading course demonstrates her self-progress in both reading comprehension and concept mapping. The first concept map (Figure 5.2) was constructed in week 1 based on the reading text about Family (see Figure 4.3); the second (Figure 5.3) was constructed in week 4 based on a text about Long-lived people (see Figure 4.5), and the third (Figure 5.4) was constructed in week 7 based on the reading text about Food (see Figure 4.9).

Figure 5. 2: *A Student's Concept Map* (Le Xuan, Week 1)
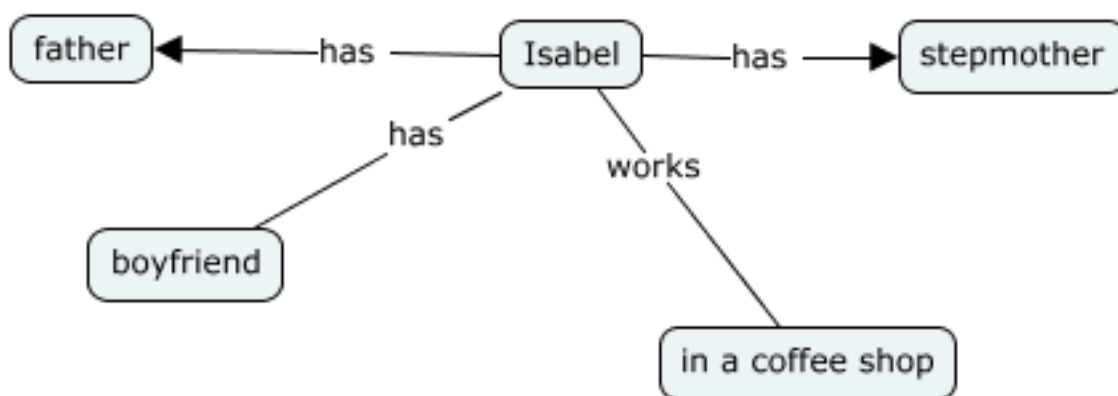
Figure 5. 3: *A Student's Concept Map* (Le Xuan, Week 4)
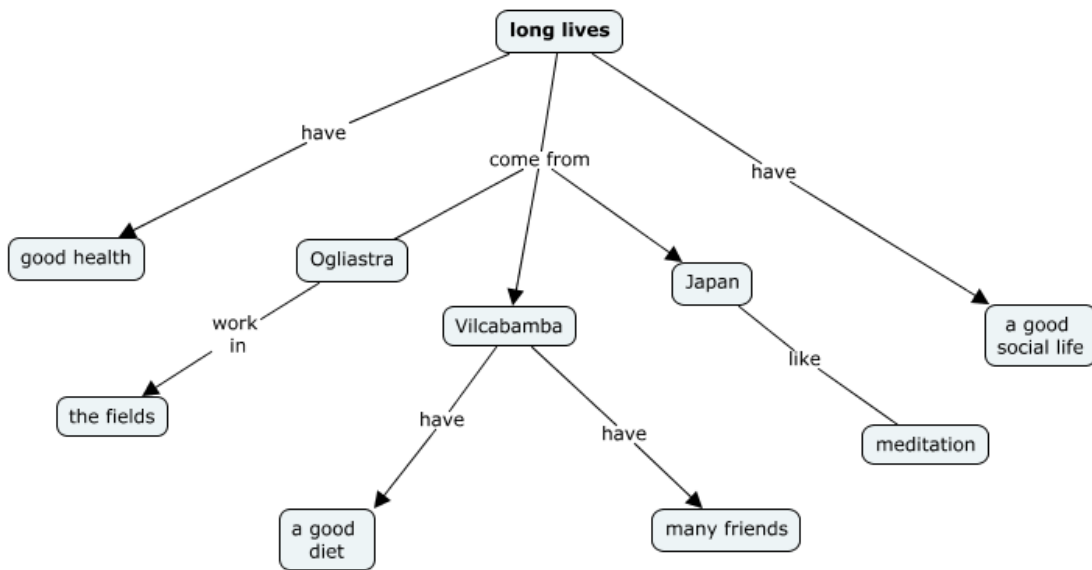
Figure 5. 4: *A Student's Concept Map* (Le Xuan, Week 7)
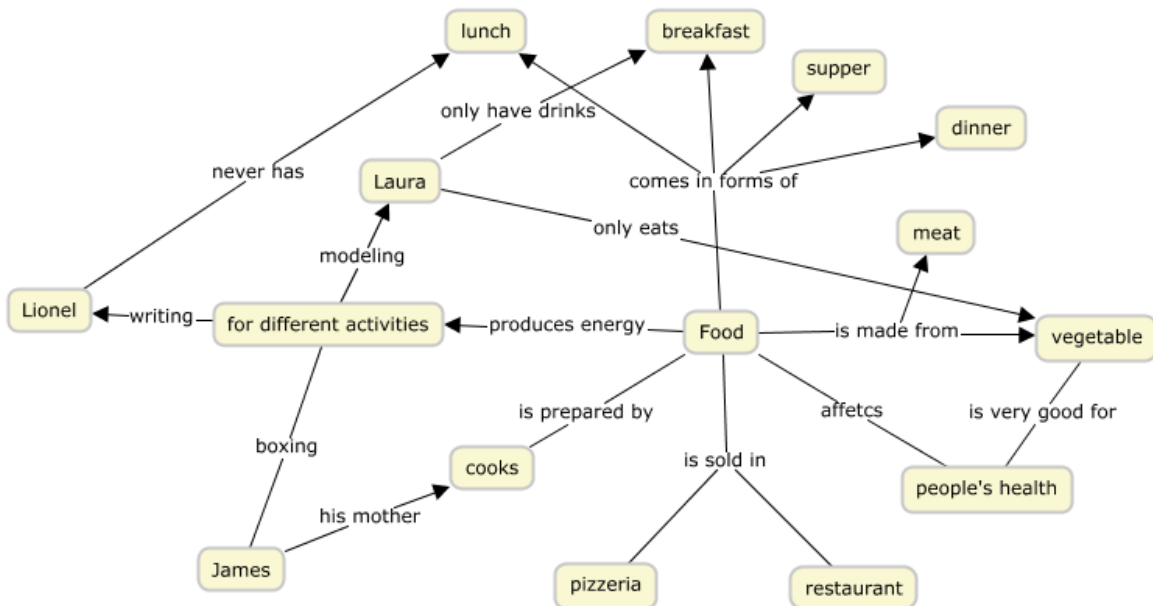
The reading text in week 1 was about family relationships. The main ideas of the first concept map included the storyteller Isabel's boyfriend, father, stepmother, brother, and her brother's girlfriend. However, Le Xuan's first concept map did not cover all the main ideas and failed to

include interrelations between these main ideas. As seen in Figure 5.2, she used simple words such as "has" and "works" to describe the relationships between the concepts.

The reading text in week 4 was about long-lived people in three different areas in the world (Ogliastra, Vilcabamba, and Okinawa). Le Xuan included the main ideas of the text in the second concept map, but in comparison with the first concept map, the second one was more comprehensive, as it covered the main ideas conveyed in the text. The use of linking words in this concept map was also more diverse than in the first: Le Xuan used different linking words such as "have", "work in", "come from" and "like" to connect concepts on the map. However, there were no interlinks among the concepts. This implies that the information on the concept map was not interconnected.

The third concept map was created based on week 7's reading text, which was about the choice of food of three people – Laura, James, and Lionel. The concept map not only covered these main ideas but also described the eating habits of these people in detail; for example, "Lionel never has lunch", "Laura only drinks (for) breakfast", and "Mother (of) James cook(s) (his) food." Notably, Le Xuan used a wide range of words to indicate the relationships between concepts in this map such as "comes from", "affect", "is sold in", "is made from". In the context of concept map construction activities in which students could relate the concepts according to their understanding, this indicated the progress in Le Xuan's text comprehension. In addition, there were interlinks among the concepts, which means that information in the concepts was interconnected to present the integration and interrelation between the ideas in the text.

In her learning journals, Le Xuan also mentioned that concept mapping helped her to assess her own reading comprehension progress. She wrote the following in her learning journal in week 7:

I think the concept map I built this week was better than the ones I did in the previous weeks. Today's maps told the main stories of the text and the key concepts were linked to each other. I think it's because I understood the text better. I think my reading improved because I could understand the text better, and my concept maps looked better. (Le Xuan, Learning Journals, EG, Week 7)

Le Xuan revealed that she was able to assess her self-progress through her concept maps and that her reading comprehension improved after the reading course because she was better able to both comprehend the text and construct concept maps. She evaluated the concept map based on the relevance with the text content and the interconnections among the key concepts.

Data from Le Xuan's interviews are consistent with the above findings. She said:

I could tell how much my reading improved by looking at my concept maps.

Researcher: Could you elaborate this point?
– The teacher always asked us to build the concept map based on our understanding of the texts. So, I can't build a good concept map if I can't understand the text. I just compare the maps built in different weeks.
Researcher: How do you know your concept map is good?
– I found out how many main ideas of the text were put in the map and how the concepts were closely connected. (Le Xuan, Interviews)

Le Xuan explained the relationship between the concept maps and her text comprehension: the better the concept maps were, the better she understood the text. She argued that it would be impossible to construct a good concept map without a good understanding of the text. By comparing her concept maps constructed at the different times, she was able to assess her own performance. She evaluated her concept maps based on the text content, the ideas conveyed in the maps, and the relationships between the concepts.

In general, this study found that concept mapping was used during the course as a tool for evaluating self-progress. As the concept maps represented their students' understanding of a text, comparing their concept maps constructed at different times enabled them to observe their learning progress. In contrast, little evidence was found for the influence of CCMAL on how students evaluated the reading materials and their personal attachment to the texts. This might be due to the nature of the concept mapping activities, which focused on presenting students'

conceptual understanding and text comprehension rather than the text format or students' personal attachment with the text. The next section discusses the findings in more detail.

5.4 Discussion

Chapter 4 discussed hypotheses 1 and 2. In this chapter, hypothesis 3, "there is a positive correlation between the use of CCMAL and students' metacognition" is discussed. This section also discussed the influence of CCMAL on the metacognitive components (planning, monitoring and evaluation) as well as the ways CCMAL influenced students' metacognition.

5.4.1 Hypothesis 3: There is a positive correlation between the use of CCMAL and students' metacognition

After the reading course, the EG students' metacognition improved significantly at $p = .00 < .05$ and was positively correlated with their concept mapping. The correlation coefficients between EG students' scores on metacognition and CM2 and CM3 were $.01 < .05$ and $.00 < .05$, respectively. A regression analysis suggests that 64% of the variability of the students' scores on metacognition could be predicted by their scores on concept maps. These statistics indicate that the students who used CCMAL had significant improvement in metacognition.

The CG students' scores on metacognition also improved after the reading course; however, p value at $.06 > .05$ indicates no significant difference in their scores on metacognition before and after the course. In addition, the EG students' mean difference between their mean scores on metacognition in the pre- and post-surveys on metacognition was .37, which is higher than that of the CG students at .20. This suggests that in comparison with traditional methods, CCMAL had a positive influence on metacognition.

A study by Wagaba et al. (2016) reported similar findings. It was a pre-test post-test research which included no control group. This study used concept maps at the end of the lesson to

build up connections between key words in a topic. Students were encouraged to use the keywords provided at the beginning of each lesson to construct concept maps. Their scores of the test items related to the summarising skill in the post-test were higher than those in the pre-test. This implied that concept mapping after the lesson helped them summarise the major concepts in a topic, thus enhancing their metacognition.

Research by Kamble and Tembe (2013) also supports the findings of the current study. Their quasi-experimental design research involved 42 college students. Twenty-one students were assigned to an experimental group that was exposed to concept mapping as a teaching-learning method and other twenty-one students were assigned to a control group that was taught the same topics without concept mapping. They found that concept mapping can significantly improve students' metacognition in comparison to using traditional teaching methods and help students with problem-solving by visually presenting their thoughts.

However, the findings of Ho's (2012) research do not support the current study's findings. Ho investigated whether concept mapping as a learning tool affected the transferability of metacognitive skills in problem solving but found no significant differences in the metacognitive skill performance of students who used concept mapping for learning and those did not. Ho (2012) explained that because the intervention was conducted in only two sessions and within a week, the concept mapping instruction might have needed more time to influence these students' problem-solving skills. At first glance, Ho's (2012) research seems to contradict the current study because it rejects the hypothesis that concept mapping has a positive influence on students' metacognition. However, it supports the current study's findings that concept mapping has a gradual influence on students' metacognition and that for concept mapping to be effective for developing metacognition students should be provided with sufficient time and exposure to it.

5.4.2 The influence of CCMAL on students' use of metacognitive components

This study found that CCMAL influenced the students' metacognitive components (planning, monitoring, and evaluation) differently; it had more influence on monitoring in comparison with planning and evaluation. Of these three components, students' means scores on monitoring improved the most (mean difference at .51, p value at .00 < .05), followed by evaluation (mean difference at .45, p value at .00 < .05), and planning (mean difference at .17, p value at .16 > .05).

Various researchers have concluded that concept mapping can positively influence students' use of monitoring strategies (Cassata & French, 2006; Channa et al., 2015; Khine et al., 2019; Seyedi, 2012; Zhang & Zhang, 2019; Zimmerman, 2015). According to Cassata and French (2006), it can be used to regulate students' learning process by requiring them to arrange the concepts on the map in relationship to the other concepts. "Telling the story", by following the paths of the links allows students to check their "sense-making" and articulate their thoughts about what they want to communicate through the concept maps them.

Khine et al. (2019) found that concept mapping helped students to regulate their reading comprehension because it enhanced their reasoning skills. Reasoning can facilitate students' metacognition as it helps them make better decisions about fixing their reading comprehension failures. When building concept maps, they must constantly make changes to them, which can develop their reasoning skills and thus improve their metacognition.

However, in the current study, no significant differences were found in the students' mean scores on planning before and after the reading course (mean difference at .17, p value at .16 > .05). These findings do not align with those of Vanhear and Johnston (2006), who, in a case study to observe the influence of concept mapping on students' use of metacognitive skills in their classroom, found that concept mapping before the lessons helped students become aware

of what they already knew. Using concept mapping in combination with a set of stimuli questions called "Vee Heuristics" (p. 4) before a lesson helped to activate their participants' prior knowledge, which is the value added by the process of concept mapping.

The current study found that although there were no significant differences in the students' scores on planning before and after the intervention, the students' scores on planning improved after the reading course. Their mean score on planning was 3.29 before the reading course and 3.46 after the reading course, making the mean difference of .17. This shows that to a certain extent, concept mapping had a positive in influence on the students' planning.

In the context of this study, CCMAL was found to have a larger influence on the students' monitoring than planning and evaluation. Nevertheless, it is likely that their planning and evaluation skills improved along with their monitoring skills due to the so called "domino effect" of the Metacognitive Management Cycle (Spencer, 2018) shown in Figure 5.5.

Figure 5. 5: *Metacognitive Management Cycle* (adapted from Spencer, 2018)

MODEL OF METACOGNITIVE MANAGEMENT CYCLE

MONITORING
EVALUATION
METACOGNITIVE MANAGEMENT
PLANNING
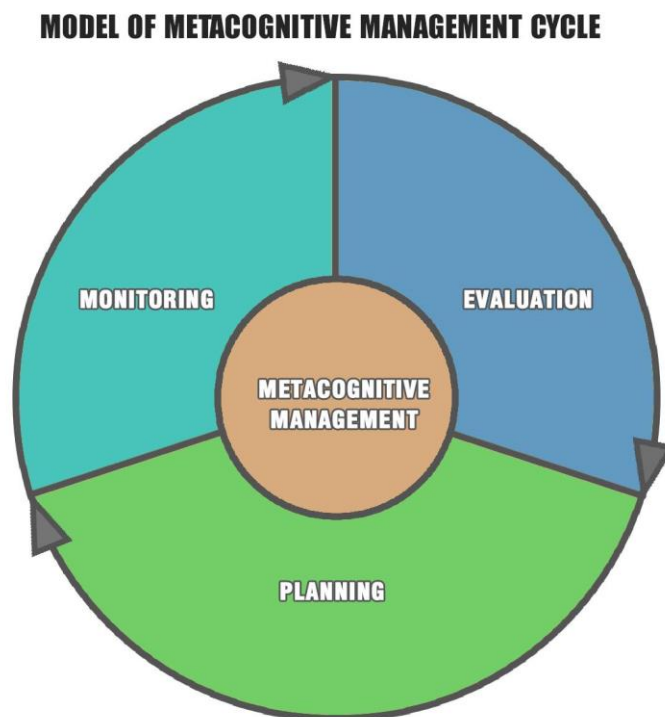
Sandars (2009) conceptualised the metacognitive management cycle as including planning, monitoring, and evaluation, and that development of one of these elements can lead to the improvement of the other two due to the so called the 'domino effect'. For example, a student might observe her concept map and realise her strengths and shortcomings (evaluation); select the appropriate skills that use these strengths to conduct the task (planning); and with sufficient knowledge and experience of the selected skills, find it easier to properly conduct and alternate between the sub-skills to ensure that the task is completed (monitoring). In this way, an improvement in any one metacognitive component might lead to development of the others.

5.4.2 How CCMAL influences students' metacognition

With regard to research question 2, "How does CCMAL influence students' metacognition?", this study found that CCMAL had a positive influence on the students' metacognition as a whole and their use of planning, monitoring and evaluation strategies.

Regarding the planning strategy, CCMAL was found to help the students anticipate the text content. By answering the focus question before the concept mapping, they were able to anticipate the content of the text before reading it. This finding aligns with those of Teo et al. (2016) that using concept mapping before reading comprehension can be an effective way to help students predict the content of the text in EFL classes.

This finding is also supported by an empirical study conducted by Tabatabaei and Khalili (2014), who found that the use of concept mapping as a pre-reading activity had a positive influence on EFL students' reading achievements and attitudes towards reading comprehension. They argued that the first step in developing concept mapping is answering the focus question through brainstorming. Students would start with their prior knowledge by reading relevant elements, then use their imaginations and creativity to develop new relationships among those concepts and propositions in order to finally reach to new meanings.

In other words, by brainstorming the concept map topic through the focus question, students could be encouraged to anticipate the content of the text. This also accords with Vygotsky's (1978) schema theory that the textual stimuli can activate appropriate schemata. Once students' schemata are activated, they are able to construct meaning of the text partly through anticipation.

Although the quantitative analysis of the current study did not show significant differences in the EG students' score gain in planning, the evidence for their use of the anticipation strategy implies that concept mapping had some influence on these students' use of planning strategies.

In terms of monitoring strategies, CCMAL was found to enhance students' use of thinking-aloud and self-questioning. In particular, the students combined the thinking-aloud protocol and self-questioning. Pottier et al. (2010) investigated the influence of concept mapping on students' problem-solving in medical class and found that it encouraged students to speak aloud their thoughts for problem-solving. They verbalised their problems while concept mapping, thus repeating their thinking. In this way they were able to find possible solutions for these problems.

The above finding is supported by the work of Cooper (2018), who found that concept mapping played the role of the catalyst for students' use of self-generated questions, thus enhancing their long-term recalling. They argued that conceptual questions that focus on linking concepts across the text can enhance students' retention due to increased understanding across concepts. At the same time, because concept maps are effective for presenting links between concepts, they can help students to increase their conceptual understanding, and thus improve their retention.

The current study also found that CCMAL had a positive influence on students' imagery. Specifically, while the students were constructing their maps, concepts from the text aroused

mental images that then connected to build a more general idea of the text. This finding is supported by the dual coding theory of Paivio (2006). This theory involves both verbal and nonverbal processing, which are mutually related. Information is processed in two forms: a linguistic form (e.g., words) and a non-linguistic form (e.g., mental images). Through concept mapping, students may process information more effectively, as they use both forms of information processing. In addition, students would have different learning preferences: some would prefer to process textual information while others would find it more effective to work with visual information. Hence, concept mapping can also address individual learning preferences by providing students with both forms of information processing.

It was also found that CCMAL influenced the students' help-seeking strategies. Although they tended to seek help from others (e.g., the teacher, peers) to solve problems at the beginning of the reading course, by the end of it they were using their own initiatives. As discussed in chapter 4, when the students comprehended reading texts that contained several unfamiliar words, concept mapping helped them guess the meaning of the unknown words by contextualising them. It is also possible that they spent time playing with the concept maps in order to predict the possible meanings of the unfamiliar words. Once the students developed their concept mapping abilities, they used them to overcome vocabulary-related problems. As a result, they reduced their reliance on help from others and increasingly promoted their own problem-solving initiatives.

The decline in students' help-seeking from others and the escalation of their self-efforts indicate that they focused more on using instrumental help and reduced their use of executive help during the course. This finding has important implications for pedagogical instruction, as instrumental help-seeking (along with its other benefits) has a positive relationship with students' academic achievements and long-term autonomy, while executive help-seeking has a

negative influence on students' long-term autonomy. As a form of instruction, concept mapping could potentially enhance students' long-term autonomy and thus their long-term learning progress.

In the post-reading phase, CCMAL helped the students with evaluating their self-progress. They were able to measure their reading progress by comparing the concept maps they had constructed at different times during the reading course. This finding is partly supported by Trang (2017), who claimed that concept mapping, when used as a consolidation strategy after the reading lesson, can help students summarise a reading text. Summarising allows students to evaluate their understanding of the text content and, by comparing these evaluations at different times, reveal their progress in reading comprehension. In this way, concept maps, which are the external representations of text comprehension, can allow students to evaluate their self-progress in reading comprehension.

In the context the current study, the qualitative data suggest that CCMAL can positively influence students' metacognition in regard to three metacognitive components (planning, monitoring, and evaluation). In reading comprehension classes, their progress requires their manipulation of the different metacognitive strategies, and their development in any of these strategies can improve their overall abilities. Therefore, CCMAL, by enhancing students' use of planning, monitoring and evaluation strategies, has the potential to be a learning-teaching method that improves students' reading comprehension.

5.5 Chapter conclusion

This chapter has presented the quantitative and qualitative findings regarding the influence of CCMAL on the participating students' metacognition. This study found that CCMAL had a positive influence of the on the students' metacognition and enhanced their use of metacognitive strategies during the reading course. In terms of planning, CCMAL helped

students with anticipating the content of the reading text by connecting the textual and visual clues.

Regarding monitoring, CCMAL enabled the students to use thinking-aloud and self-questioning strategies, and it positively influenced learning strategies such as imagery and help-seeking. The students used visual imagery for comprehending the text by connecting mental images from different concepts to build a broader picture of the text content. Interestingly, CCMAL influenced the students' use of help-seeking strategies; the more they used concept mapping for learning, the more they made self-efforts and reduced their reliance on their teacher's and peers' help. The students also became more active in exchanging ideas and discussing with their peers by the end of the reading course.

In terms of evaluation, CCMAL increased the students' course satisfaction by not only empowering them but also enhancing the teacher's caring. The students agreed that concept mapping gave them more power over their learning by allowing them to make their own decisions about their concept maps.

Chapter 6 presents the findings for research question 3: "What are the possible factors influencing students' CCMAL learning experience? It also discusses these factors in light of the literature.

CHAPTER 6: THE FACTORS THAT INFLUENCE STUDENTS' CCMAL LEARNING EXPERIENCES IN EFL READING COMPREHENSION CLASSES

6.1. Introduction

Chapters 4 and 5 respectively presented the findings and discussions for research question 1, "How does CCMAL influence students' reading comprehension?" and research question 2, "How does CCMAL influence students' metacognition?". This chapter presents the findings and discussion regarding research question 3, "What are the possible factors that influence students' CCMAL learning experiences?" Based on these findings, the researcher has been able to provide further insights and recommendations for educators and curriculum designers in terms of integrating or designing CCMAL into the curriculum for learning English as a foreign language.

As discussed in Chapter 1, the teaching instructions in EFL classroom in Vietnam are mainly traditional (Son, 2011). It is necessary that more student-centred teaching methods be conducted to improve students' English fluency in general and reading comprehension in particular. This study aims to identify the influence of a student-centred learning tool on students' reading achievement with the effort to provide an insight of the role of the student-centred teaching approach in the current EFL teaching context in Vietnam. Furthermore, the findings from this study might provide implications which can help teachers improve their teaching practice. The curriculum designers might also interpret from the findings of this study some suggestion for designing better quality materials.

In this chapter, data were incorporated from quantitative sources such as the students' survey on metacognition, and qualitative sources that include the individual student interviews, which were conducted at the completion of the reading course, and the students' weekly learning journals. Data were also collected from students' concept maps collected in weeks 1, 4 and 7 of

the reading course, and from the classroom observations conducted for every lesson of the reading course. Interviews were conducted with 12 students from the experimental group (EG), and learning journals were collected from 21 EG students.

This chapter presents and discusses the factors that influenced the students' experiences in CCMAL learning.

6.2. The factors influencing the students' concept mapping in EFL classes

This study found that the participating students' CCMAL learning experiences were influenced by the following factors in an EFL reading comprehension classroom context:

- the relevance of the text topics to their prior experiences;

- individual differences, such as their prior knowledge in concept mapping and technology use; and

- the affordances of Cmap, which was the concept mapping software used in the current study.

Generally, this study found that the factors influencing students' concept mapping experience included both student-related factors and environment-related factors. As defined by Cambridge dictionary, 'factor' is referred to as the elements contributing to the results or situation. In this study, students' prior knowledge and experience in concept mapping, the topic of the reading texts as well as the affordances of the concept mapping tool contributed to how students construct the concept maps. Therefore, these elements are categorised as the factors that might influence students' experience in concept mapping during the reading comprehension classes.

During the data analysis process, the researcher analysed across the scripts of the qualitative data including students' learning journals, students' interviews, classroom observation, and

students' concept maps. Data from learning journals, interviews and classroom observation were analysed based on the thematic analysis procedure. This process resulted a number of themes. The researcher compared these themes across the sources of qualitative data and selected the general themes that were suggested from different sources. Afterwards, the researcher investigated students' concept maps and sought the evidence for the findings interpreted from the interviews, learning journals and classroom observation.

6.2.1. The relevance of the text topics to the students' prior experiences

The data suggest that reading the text topics greatly influenced the students' experiences of learning reading comprehension using CCMAL. Half of the interviewed students (six out of 12) indicated that the more the text topic was relevant to their experience, the better they could construct their concept maps. For example, Le Xuan said:

> *I think I could build up the concept map better in some weeks when the texts were about what I saw in my daily life. When the content of the text is closed to what I knew, I could understand the text better. So, I could find out the key words and the relationships between them better. I could even use some words outside the text to explain my ideas. You know, sometimes, using only the words in the text is not enough.* (Le Xuan, Interviews)

Le Xuan said that familiar reading topics facilitated her text comprehension. Hence, she found it easier to identify the key concepts from the text as well as the relationships between them. She could even use some concepts outside the text to clarify and broaden her ideas.

The data from the classroom observations suggest similar findings. The observation field notes of weeks 6 and 7 described the difference in students' classroom engagement due to the topics of the texts in these two weeks. Following are the observation field notes in week 6 and week 7:

> *While constructing the map based on the reading text about Dublin, students asked for the teacher's help with the words related to the city such as "monuments" or "tour buses". One student even asked the teacher "Where is Dublin?" Although a few students seemed to work attentively without asking for the teacher's help, most of them asked the teacher about the meaning of the unfamiliar words in the text.* (Observation field notes, EG, Week 6)

Students were asked to construct a concept map based on the text about Food…. They were observed to actively construct the concept maps. Only a few students asked for the teacher's help during map construction. Instead, they worked meticulously; some of them were seen to be very quick in building their concept maps. (Observation field notes, EG, Week 7)

These observation field notes reveal that the reading text topics might have had a profound influence on the students' classroom engagement. In week 7, the students actively engaged in map construction, perhaps because the topic was closely related to their everyday experience. The students' rich experience in the text topic could have facilitated their text comprehension, and thus their concept mapping. By contrast, in week 6 the students seemed less confident when they worked with the reading text about travelling in Dublin. They asked the teacher about words such as "tour buses" and "monuments". This might have come from the gap between their real-life experiences and the reading text. If there were no tour buses or monuments in the town where they lived, they would find it hard to relate to or understand these words. The student who asked the teacher "Where is Dublin?" is likely to have had minimal experience of that city.

Two-thirds of the collected learning journals (15 out of 23) consistently mentioned that a reading topic that was closely related to students' prior experience was likely to facilitate their reading comprehension and thus their concept mapping. Ha Nga's learning journal revealed:

Concept mapping was quite easy this week. The text was about food so I could understand it pretty well. I eat food every day, I think I know quite well about it. The map of this week contained both words from the text and outside the text. (Ha Nga, Learning Journals, EG, Week 7)

Week 7's reading text was about food, which was intricately connected to Ha Nga's daily life experience. She believed that it was the reason why she found it easier to construct the concept map about "Food". Figure 6.1 is Ha Nga's concept map, which was constructed in week 7.

Figure 6. 1: *A Concept Map Constructed by an EG Student* (Ha Nga, Week 7)
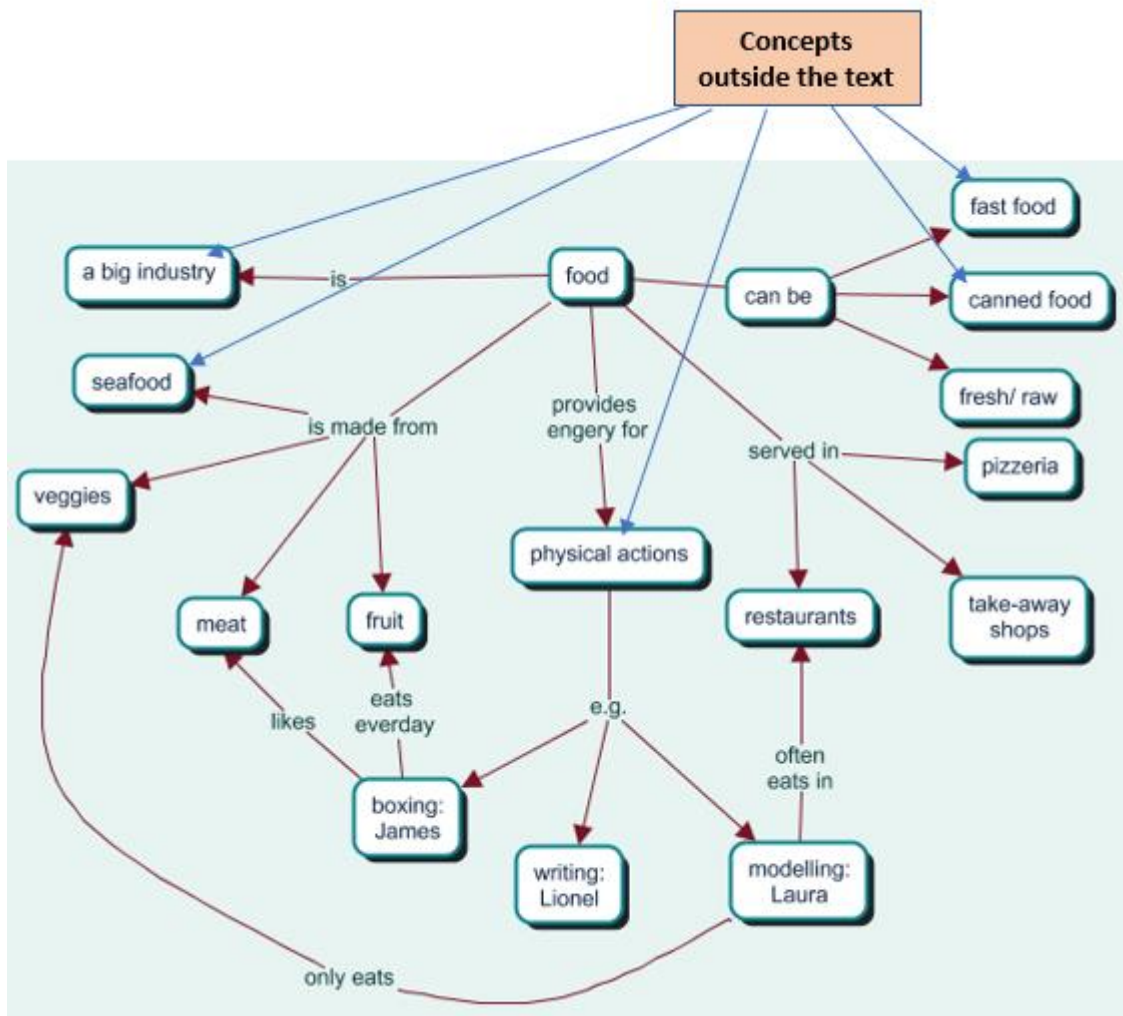
This concept map was constructed based on the text about Food (refer to Figure 4.9 for the full text). It shows that Ha Nga covered many key concepts in the text and presented most of its main ideas. Ha Nga also revealed that because the topic was so familiar to her, she could involve some concepts outside the text in her map to make it more comprehensive and interesting. As annotated in Figure 6.1, besides the concepts from the text such as "food", "meat", "boxing", "fruit", "restaurants", Ha Nga also used several concepts that were not included in the text such as "seafood", "canned food", "physical action" or "industry". She is likely to have eaten or seen people eating "seafood" and "canned food" in her daily life; hence, she came up with such propositions as "Food can be canned food" and "Food is made from

seafood". As well, the reason she included the proposition "Food is a big industry" in the concept map might be because she had seen food being sold in many places (e.g., shops, stores, supermarkets, and open markets).

In contrast, Ha Nga's learning journal revealed that her concept map, which was constructed in week 6, did not include any additional information since she had little experience of Dublin:

> *This week, the text was about traveling in Dublin. I barely knew about this city before, so I found it hard to build the concept map. My map included only words from the text. I could not add any words outside the text because I did not really know any other information about this place. My map was not too bad but if I had known about Dublin better, my map could have been more interesting.* (Ha Nga, Learning Journals, EG, Week 6)

Ha Nga explained that because she had little experience travelling in Dublin, she found constructing the concept map about travelling in Dublin difficult. She also said that she could have constructed a better concept map if the text had been more familiar to her daily life.

Interestingly, this study found that the students' preferences for text topics also influenced their concept mapping. In her interview, Khanh Huyen reported that the "interestingness" of the reading texts influenced her concept mapping and that the more interesting the reading topic was, the better was her concept mapping:

> *Once the text interested me, it made me want to read because I want to know more about it. And when I understood it better, I could build a better concept map about it.* (Can you explain a bit more? – researcher) - *I mean I am interested in something funny and close to what I knew. I don't like the topics about specific fields of science such as energy, biology, chemistry. I prefer something around my daily life such as music, movies, etc. Something about what I knew and what I liked.* (Khanh Huyen, Interviews)

Khanh Huyen argued that she would have felt more motivated to explore the content of a text if its topic had been interesting to her. Initially, she used the term "sự thú vị", which means "interestingness" in English. However, the term "interestingness" was poorly defined; her explanation of the term was closely related to the familiarity with the text topics. To some extent, she referred to the interestingness of the text in terms of its relevance to her daily life experience, although personal preference could be related to this aspect as well.

Similarly, another student – Duong Hien – claimed that she preferred texts topics more closely aligned with her real-life experience:

> *I preferred reading about what I knew in my daily life to what was completely strange to me because the information in these texts sometimes reminded me of my own memories. When the texts were close to my life, my concept maps were better than the ones I built when the texts were about something I had not seen before.* (Duong Hien, Interviews)

In her learning journals, Duong Hien similarly revealed that she preferred a text topic that was closely related to her daily life than to one that was unfamiliar to her experience. The following excerpts are from Duong Hien's learning journal in weeks 3 and 4:

> *The concept map was about music. I liked music, but the type of music in the text was not interesting to me because I hardly watched a program about it. I often listened to Pop music and Country music because people played them in cafes, restaurants, shops, everywhere.* (Duong Hien, Learning Journals, EG, Week 3)

> *This week, I built up a concept map about long-lived people. I really liked this topic because I knew some long-lived people. Some people are living up to a hundred in my village so I could understand the text quite well.* (Duong Hien, Learning Journals, EG, Week 4)

Duong Hien declared that she was not interested in the text topic of week 3, which was "classical music", because she hardly connects to it. Classical music might not be popular in people's daily lives where Duong Hien lived because it would not be played frequently in the shops, cafes, restaurants or on television. In contrast, she was interested in the text topic in week 4, which was about "long-lived people" because she knew some long-lived people. The information of the text about long lives was more understandable to her as she could relate it to her real-life experience.

Consistent with Duong Hien's learning journals, her concept map constructed in week 4 (Figure 6.2) includes a number of concepts and relationships that represent her understanding about long-lived people.

Figure 6. 2: *A Concept Map Constructed by an EG Student* (Duong Hien, Week 4)
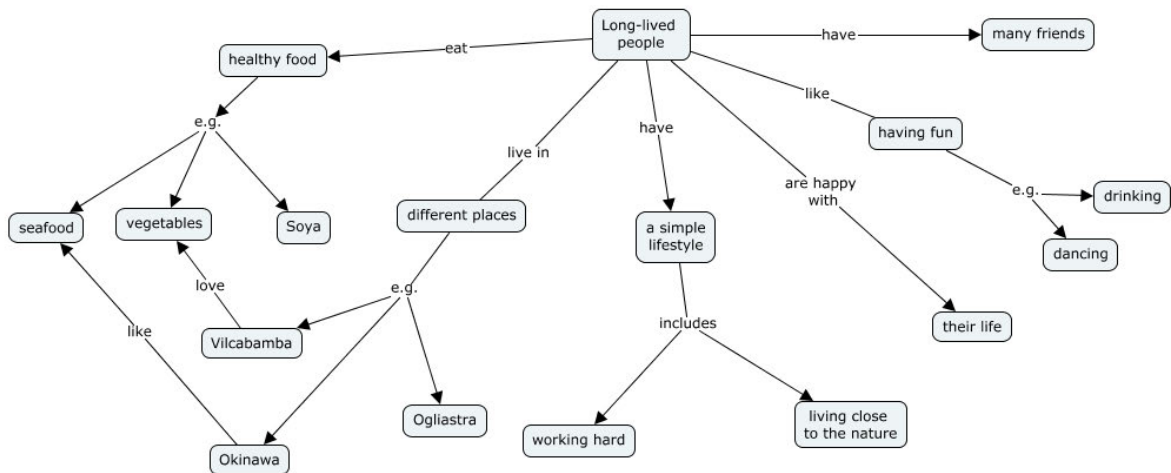
As indicated in Figure 6.2, Duong Hien's concept map not only involved the main ideas of the reading text, which was about the long-lived people living in different areas in the world (Vilcabamba, Ogliastra and Okinawa), it also included information not directly conveyed in the text, such as "long-lived people have a simple lifestyle (such as) living close to the nature, (and) working hard", "long-lived people have many friends", and "long-lived people are happy with their life". It is apparent that Duong Hien had some knowledge of long-lived people. She interprets them as having simple lives, living close to nature, working very hard, having many friends, and being happy with their lives. It is likely that Duong Hien's personal preference for this topic motivated her to explore for more information for the concept map.

In summary, this study found that the relevance of the students' previous experiences to the text topics greatly influenced their concept mapping. Anohina-Naumecca (2013) similarly found that volume and quality of the mappers' knowledge influenced their concept mapping ability. The importance of volume and quality of the mappers' prior experience is coming from the general theory of concept mapping suggesting that students with little prior experience will have problems with the integration of new concepts into their knowledge structure and into the

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externalisation of that structure due to knowledge gaps and inconsistencies (Novak & Canas, 2007, 2008). Hence, students' familiarity with a domain might help them embed new concepts in their pre-existing experience and thus facilitate their concept mapping. In addition, Simone (2007) has argued that when a knowledge domain is new to students, they might have difficulties in connecting new information to their prior knowledge. They might also fail to make sense of newly acquired information. Hence, it is easier for students to comprehend the text if its topic is relevant to their prior knowledge and experience.

Moreover, this finding is partly supported by the Schema Theory in reading comprehension. Schema theorists assert that students' prior knowledge and experience are stored in the units called 'schema' (plural form 'schemata') (Al-Issa, 2006; An, 2013). An (2013) presents three types of schemata in reading comprehension: (1) *linguistic schemata* refers to a reader's existing language proficiency in vocabulary, grammar and jargon, (2) *formal schemata* refers to the rhetorical structures of text types, and (3) *content schemata* refers to the knowledge relative to the content domain of the text. Of these, content schemata are related to students' background knowledge and prior experience of the text topic.

In the process of comprehending a reading text, students' schemata can be activated by the words or phrases in the text (known as *stimuli*), which are highly suggestive and lead students to a certain schema. Students' schemata can influence their text comprehension because, as schema theory conceptualises, reading comprehension is an interactive process in which students construct a meaningful representation of the text using their schemata (Al-Issa, 2006; Carrell & Eisterhold, 1983). In particular, content schemata can facilitate students' reading comprehension by compensating for their lack of language knowledge (Asmari & Javid, 2018). The students thus have better comprehension if the reading text topics are familiar from their prior experience.

In the context of this study, when the participating students read the texts that were closely aligned with their prior experiences, their content schemata were activated. Because the text topic was familiar to the students, their text comprehension was facilitated because they could relate the textual information to their experience and use their prior experience as to compensate for their insufficient language proficiency. Their stored patterns could also support their comprehension by providing further information for the text content. Similarly, since concept maps are the representations of students' text comprehension, it is likely that the more the students comprehended a text, the better they constructed their concept maps.

This study also found that the students' preferences for text topics could influence their' concept mapping. They preferred reading texts about daily experiences they were familiar with. This finding aligns with those of Charzyńska (2015), who showed that college students had deeper comprehension of texts containing topics they had greater interest in. In other words, the preferred texts aroused the processes of attention and engagement to a greater degree than less interesting texts. This in turn improved the students' comprehension of the preferred reading texts. Springer et al. (2017) also found that once students personally prefer a reading text, they put more cognitive effort into the comprehension process.

By contrast, in a study conducted with 24 advanced EFL college students, Eidswick (2009) collected students' scores on different reading texts and found that personal preferences for reading text topics among advanced EFL readers did not necessarily result in improved reading comprehension. It could be argued that advanced EFL students should already have sufficient knowledge of vocabulary and grammar, which are important to text comprehension. In addition, advanced readers might turn reading comprehension into a strategic process through which they use different reading comprehension strategies. For these reasons, advanced readers

might achieve good reading comprehension scores even though they do not personally prefer the text topics.

In the current study, however, the participants were first-year students who were at elementary level of English proficiency based on the site university's input examination. For such readers, reading comprehension could also involve their bringing emotional engagement and personal meaning to the texts (Charzyńska, 2015). Therefore, if elementary readers are to become advanced EFL learners, it may be crucial to provide them with preferred comprehension texts that they can relate to.

In this study, the qualitative evidence supporting its findings mostly came from student interviews, learning journals and concept maps and classroom observations. Little evidence was found from other sources such as classroom observations, possibly because in some cases the students' personal preferences for text topics had a psychological aspect that could not be captured in the classroom observations of their behaviours. In contrast, the students tended to express their preferences for the text topics verbally through the interviews or learning journals. Nevertheless, the evidence collected from interviews and learning journals consistently suggests the influence on the students' concept mapping of their personal preferences for text topics.

6.2.2. Students' prior knowledge of concept mapping

Data from the students' interviews suggest that their previous knowledge and skills of concept mapping influenced their experiences of it during the study. For example, Le Xuan said:

> *I think whether I used concept maps before could affect my concept mapping. There were a lot of new things I had to learn, such as finding the key words or finding out how they were connected; using computers as well. If I had known these things already, then of course I wouldn't have to learn them again, and just built the concept maps.* (Le Xuan, Interviews)

For Le Xuan, concept mapping required the manipulation of new skills such as identifying concepts for the concept maps, identifying the relationships between the concepts, as well as using computers. Hence, previously learned skills in concept mapping could have helped her with map construction during the course.

Classroom observation field notes in week 4 also revealed that some students were shown to be more skillful than other students in concept mapping:

> *While constructing the concept map about long-lived people, many of the students had difficulties in concept mapping and they asked the teacher many questions about concept mapping. However, some other students were seen to be quicker than their classmates in constructing concept maps. These students seemed to be experienced with concept mapping as they were quick in identifying concept for the concept maps and the relationships between concepts. They also could manipulate concept mapping without much help from the teacher.* (Observation field notes, Week 4)

The observation field notes also revealed that some students encountered problems during map construction, possibly because that they did not have prior experience of concept mapping before the reading course. In contrast, other students were more skillful in manipulating concept mapping than their peers, taking less time to identify concepts and the relationships. This might have been because they had already acquired the skills necessary for concept mapping.

The students' learning journals also showed that students who had prior knowledge of concept mapping found the activity not too challenging. Others wrote that they had problems during map construction because concept mapping was completely novel to them. The following excerpts are from Thu Trang's and Thuy Dung's journals:

> *I knew about this learning method* (concept mapping - researcher) *a while ago and I also had used it for my study sometimes… In this course, what I knew about concept mapping helped me a lot; I could identify key words and connecting them more quickly than my classmates.* (Thu Trang, Learning Journals, EG, Week 4)

> *I was asked to build the map about Food; it was so difficult for me to build the concept map. I had to find out key words in the text and link them together on the map. I haven't used this method for my study before, so these things were just so hard for me. I could not find many key*

words from the text and finding the links between the key words was so difficult for me, too.
(Thuy Dung, Learning Journals, EG, Week 4)

Thu Trang reported that she had previous knowledge of concept mapping before the reading course and that she could manipulate concept mapping more quickly than her peers. By contrast, Thuy Dung, who had no prior knowledge of concept mapping, found it difficult to manipulate even when the topic was relevant to her everyday experience.

The analysis of these two students' concept maps complements the finding that students' prior knowledge of concept mapping can influence their subsequent experiences of it. In week 4, the students were asked to construct a concept map based on a reading text about long-lived people (refer to Figure 4.5 for full text). The following concept maps constructed by Thu Trang and Thuy Dung, who had varied experience with concept mapping, were analysed in terms of content and structure.

Figure 6. 3: *A Concept Map Constructed by an EG Student* (Thu Trang, Week 4)
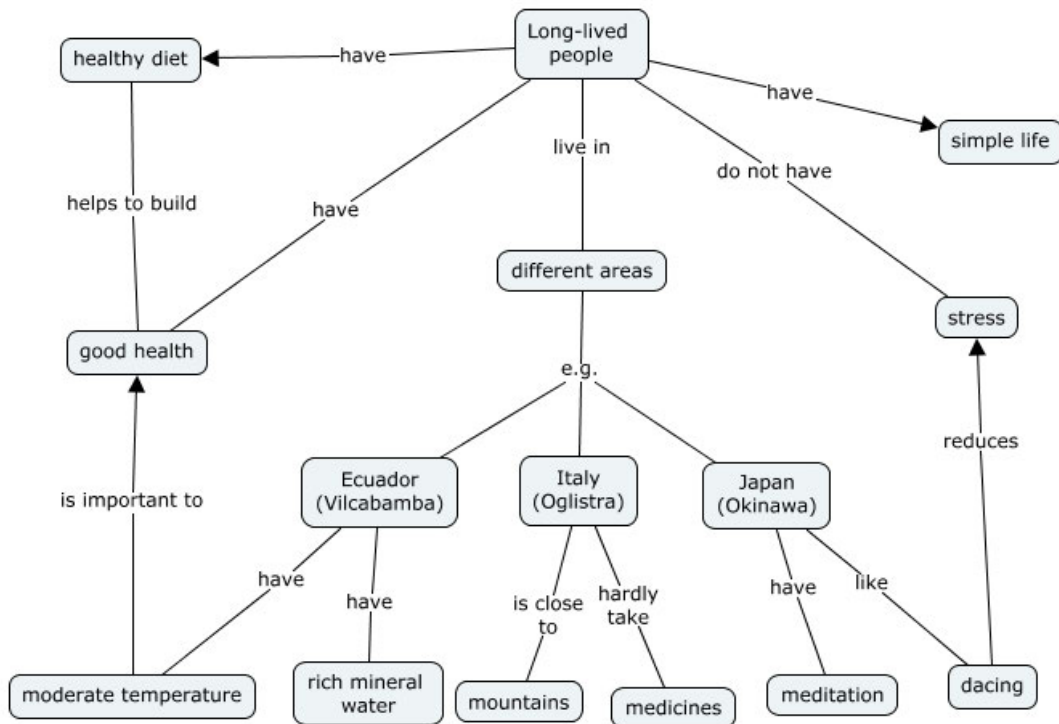
Figure 6. 4: *A Concept Map Constructed by an EG Student* (Thuy Dung, Week 4)
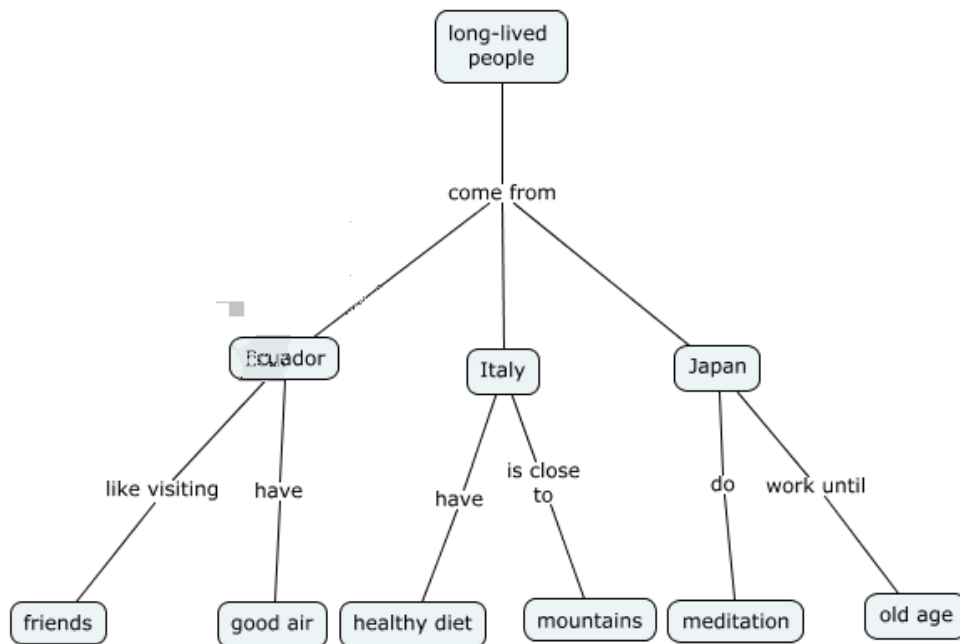
Figure 6.3 is a concept map constructed by Thu Trang, who claimed to have prior knowledge in concept mapping, and Figure 6.4 was constructed by Thuy Dung who identified herself as a novice concept mapper. Figure 6.3 includes more concepts and relationships between concepts than Figure 6.4. The former covers most of key ideas from the text, including some outside the text such as "long-lived people have simple life" and "moderate temperature is important to good health", while the latter covers only some of them.

In terms of concept map structure, Figure 6.3 has both linear and non-linear elements, showing a relatively comprehensive picture of this student's ideas about the text. In contrast, Figure 6.4 includes only a linear structure of the text content, with interrelationships between concepts.

In both concept maps, a wide range of relationships (e.g., "like", "have", "is close to") are apparent. However, some relationships shown in Figure 6.3 (e.g., "is important to", "is close to", "help to build") are more precise in comparison to those in Figure 6.4 (e.g., "have", "do",

"work until"). In particular, Thu Trang used examples to further illustrate the countries of the long-lived people, and she presented the key ideas of the reading text by the proposition "long-lived people live in different areas, e.g., Vilcabamba (Ecuador), Ogliastra (Italy), Okinawa (Japan)". Thuy Dung used the less precise proposition "long-lived people come from Ecuador, Italy, Japan".

Thu Trang also mentioned in her interview that her previously acquired skills of constructing concept maps had facilitated her concept mapping during the course:

> *I read about concept mapping a few months ago on a website for English learning. It was really interesting, so I decided to apply it for some of my lessons ever since. During this reading course, concept mapping was quite easy for me because I knew how to use it already. I was always the one who finished the concept maps before my classmates. I also helped them with concept mapping.* (Thu Trang, Interviews)

In general, this study found that the participating students' experiences in CCMAL learning were possibly influenced by their prior experience of concept mapping. Such experience would be obviously crucial because concept mapping demands a wide range of skills (e.g., connecting concepts, arranging concepts on the concept map) that are different from traditional reading comprehension skills. This finding is supported by Anohina-Naumecca (2013), who argued that concept maps could be used for the elaboration of students' knowledge structures. Concept mapping requires changes in ways of thinking because the whole picture of a knowledge domain needs to be seen. By constructing a concept map, students are attempting to relate prior knowledge to new information. Therefore, students' previous understanding and use of concept maps could facilitate their organising and connecting ideas on the maps.

The current study's findings are congruent with Novak and Canas's (2007) conclusion that students' difficulties in the construction of concept maps, at least early in their experience of them, may be related to their previous learning patterns. After years of rote learning practice at school, students expect it to continue. Concept mapping exposes students to new learning

patterns that are more meaningful and helps them to connect prior knowledge and new information. However, such changes might initially interfere with the students' map construction.

Concept map construction generally consists of "fill-in-the-map" and "construct-the-map' activities (Novak & Canas, 2004). The "fill-in-the-map" activity requires students to complete the concept maps based on a given list of concepts and relations, and the "construct-the-map" activity requires them to select concepts and relations to create concept maps by themselves. The latter can be difficult for students if their previous learning experiences mostly include rote learning. Students who were used to rote learning might expect to do what is required by the teacher step by step without too much reasoning. Hence, the "fill-in-the-map" concept mapping activity is more likely to benefit students with little experience than would the "construct-the-map" activity. "Fill-in-the-map" acts as a scaffolding system by providing novice students with the structure of the map and with the available concepts or relationships needed to fill in the nodes and put on the links. "Construct the map" might be more effective for students with prior experience in concept map construction.

Canh (2001)'s description of a typical traditional classroom in Vietnam involved the teacher acting as a knowledge provider and students following the teacher's instructions step by step to complete the tasks. Students who were used to rote learning might expect to do what is required by the teacher without asking why they are asked to do so. One of the students' learning journals provided similar ideas:

> *I don't like working with this concept mapping. I don't know what to do. I have to find the way do everything by myself. I found that when my teacher tells me what I have to do clearly and makes an example for me, I do things more easily.* (An An, Learning Journal, EG, Week 3)

This student found it hard to complete a concept map by herself because she might get used to being told what to do by the teacher. In contrast, concept mapping activity allows the variation

in how students construct their concept map and what their concept maps look like. In many traditional classes, teachers might split a learning task into smaller ones. Splitting tasks and giving examples make the teaching more convenient as students only need to follow the teachers' instructions step by step. Nevertheless, this might eliminate students' initiative as they are not encouraged to think and work independently. Students who are exposed to rote learning for a long time tend to expect elicit instructions and modelling from their teachers (Novak & Canas, 2007). Therefore, they might fail to develop reasoning skill which is critical to learning.

The finding that students' previous experiences of using concept maps influence their concept map construction is favoured by Assimilation theorists (e.g., An, 2013; Ausubel, 1978) who consider reading comprehension a dynamic process involving the interaction of students' prior knowledge and the reading texts. The more prior knowledge and experience in concept mapping students have, the more their concept mapping is facilitated. This is because their previous experiences of concept mapping provide them with the background skills that can scaffold their map construction. It is therefore important that different teaching strategies are used to activate students' prior knowledge. Campbell and Campbell (2009) introduced effective strategies for relating what students already know and what they want to know, such as questioning, brainstorming and elaboration. Yuksel (2012) has added that students' prior knowledge can be activated through teachers' use of discussion and graphic organisers.

6.2.3 Students' previous knowledge in technology use

This study also found that the participating students' previous knowledge in technology use influenced their CCMAL learning experiences. Item 3 of the section on demographic information in the Questionnaires on Metacognition asked the students if they used technology for their learning. Of the 50 EG students, 37 students said they did and 13 said they did not. In

terms of technology use, the EG students were randomly assigned into two groups: those with and those without prior experience in technology use. Grouping the students into each group was a completely randomised process as the researcher had not influenced the students' responses to the questionnaire items. According to Vanhove (2015), such radomisation might cause groups to have unequal sample sizes as the researcher would have no control of the grouping process, and it could increase the representativeness of the data when the sample size is relatively small.

In week 1, the 37 students who had previously used technology for learning had a mean score on concept mapping of M = 7.11, which was significantly higher than that of the students who had not used technology: M = 5.33 (p = .01 < .05). Similarly, the mean scores on concept maps collected in weeks 4 and 7 of the students with previous experience of technology were M = 7.88 and M = 10.47, respectively, while the mean scores of those without previous experience were M = 6.00 and M = 8.50, respectively (p = .01 < .05 and p = .02 < .05, respectively). In summary, in the beginning, in the middle, and at the completion of the reading course, the students with prior knowledge of technology use had significantly higher mean scores than those without that knowledge.

This finding is consistent with data from the classroom observations. The observation field notes in week 7 documented the students' CCMAL learning experience:

> *While constructing the concept map about Food, some students were observed to be very competent in using the computer such as using the keyboard and the mouse. They were also quick in concept mapping, too. They could easily locate the software; they were also quick in changing the font and size of the text, adding or deleting the nodes and links, rearranging the concepts on the concept maps, and saving the concept maps. These students also helped their peers who still had difficulties in manipulating the software. A student had troubles with using the linking feature of Cmap and he was helped by another student who was better at technology. I also saw a student helping some other students how to insert the photo into the concept map.* (Observation field notes, EG, Week 7)

The students who seemed to be more competent in technology use than others were observed to be proficient in using software features such as adding or deleting nodes and links to their concept maps. They were also expeditious in trouble shooting while constructing the maps and when rearranging the concepts and the links on them. Also, when other students were having difficulties in constructing their concept maps, the experienced students taught them to use the features of Cmap, to trouble shoot, and to insert photos into the maps. In this way, their prior experience with technology not only facilitated their own concept mapping, it also allowed them assist fellow other students with their mapping. Thu Ha said:

> *I am quite confident with my computer skills. My parents bought me a computer when I was at high school and I have used it for my study ever since. Also, I like exploring different things in IT* (Information Technology - researcher). *I was always quicker than my classmates in concept mapping. They often asked me for help with IT things like how to save the file or how to add a photo to the map. My IT skills helped me a lot with concept mapping.* (Thu Ha, Interviews)

Thu Ha reported that she could construct concept maps more quickly than her classmates. She believed that her prior experience in technology was useful in her concept mapping. She explained that because she had a computer at home and she liked using it for her study, she was more competent in technology use than other students in her class.

Data from the students' learning journals supports this finding. The following excerpt is from Thu Ha's learning journals in week 7:

> *After finding out the topic of the text, I started to draw the concept map about food. It was not too difficult to do concept mapping because I learnt to use the software quite quickly. I use my computer for study every day so I can use the computer to build my concept map.* (Thu Ha, Learning Journal, EG, Week 7)

Congruent with the data from her interview, Thu Ha wrote that her background in technology use had helped her learn to use the concept mapping software more quickly. She also helped other students with technological problems. Thu Ha's concept map also indicates that her technological skills were useful in helping her with concept mapping process. Figure 6.5 is the concept map constructed by Thu Ha in week 7:

Figure 6. 5: *A Concept Map Constructed by an EG Student* (Thu Ha, Week 7)
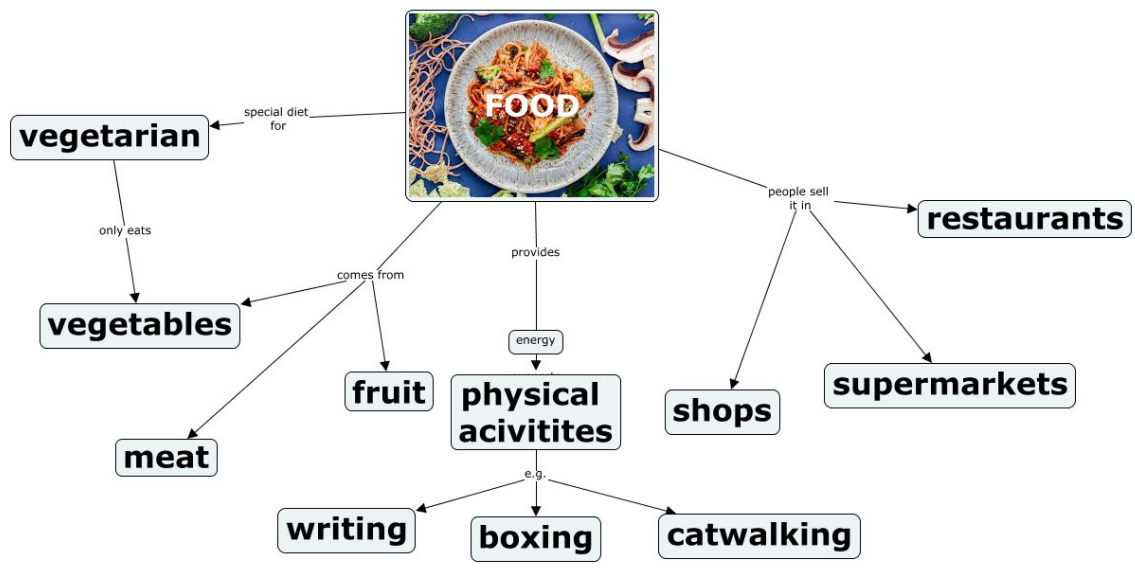
Figure 6.5 shows that Thu Ha could easily use the advanced mode for concept mapping on the computer. The advanced mode of concept mapping requires mappers to have high technological skills. Specifically, she used photos to illustrate the concepts in the nodes, and she also changed the font and size of the text in the nodes.

In contrast to Thu Ha's case, An An's learning journals revealed that she had little previous knowledge in using technology for learning:

> *Today, I built the concept map about food. It was a little bit hard for me to draw the concept map on the computer screen. Actually, I don't have a computer at home, so I don't use IT for my learning. I was not confident with using the mouse, the keyboard.* (An An, Learning Journals, EG, Week 7)

In her learning journals, An An revealed that her lack of knowledge about using technology had led to her difficulties in concept mapping using a computer. Data from An An's concept map (Figure 6.6) accord with her learning journals.

Figure 6. 6: *A Concept Map Constructed by an EG Student* (An An, Week 7)
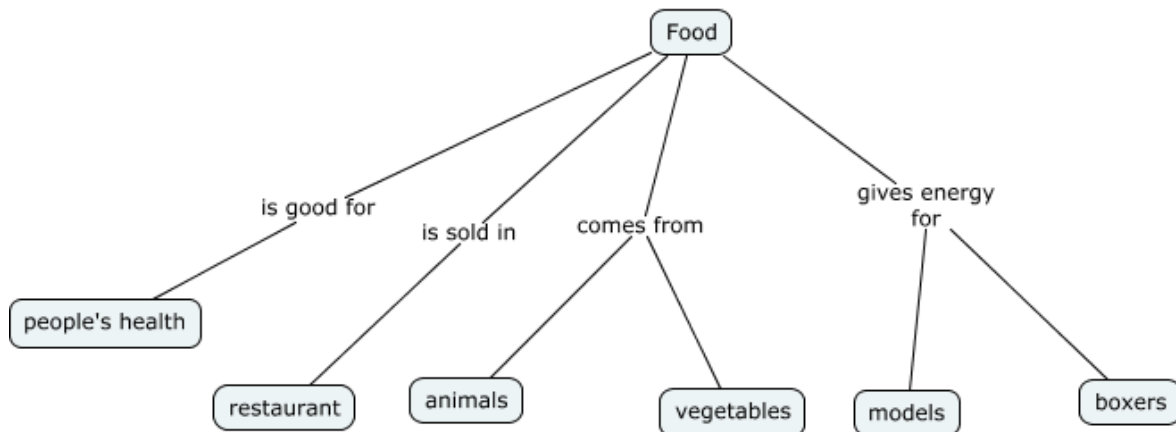
Figure 6.6 is An An's concept map, which was constructed in week 7 using the available nodes and links from the Cmap software's default mode. Compared with Thu Ha's concept map (Figure 6.5), which has interconnections indicating complex relationships between concepts, An An's map shows only linear relationships between concepts.

Analysis of Figures 6.5 and 6.6 shows that Thu Ha's concept map has 11 concepts while An An's has only six. Thu Ha gives examples for the concept "physical activities" (e.g., writing, boxing, cat walking), but An An gives no examples. Figure 6.5 shows three outlets where people could find food ("restaurant", "shops" and "supermarkets"), while Figure 6.6 shows only "restaurant". Thu Ha also uses arrows to indicate relationships between concepts and An An uses a simple line. Moreover, Thu Ha uses a variety of nouns and gerunds as the concepts, while An An uses only nouns.

However, it is noticeable that the relationships in the An An's concept map are more specific than those in Thu Ha's. In the second concept map, An An has includes the propositions "Food is good for people's health", "Food is sold in restaurant", "Food comes from animals/ vegetables", and "Food gives energy for boxers/models". In these propositions, the

relationships between the concept "Food" and "people's health", "restaurant", "animals/ vegetables" and "boxers/ models" are specific. In contrast, some of Thu Ha's propositions do not indicate the specific relationships between the two concepts. For example, in the proposition "Food special diet for vegetarian", it is difficult to identify the relationship between "food" and "vegetarian". Similarly, in the proposition, "Food people sell it in restaurants, shops, supermarkets", the relationship between "Food" and "restaurants, shops, supermarkets" is not specific. In this situation, Thu Ha might have focused on the communication of the whole concept map rather than on the specific relationships between the concepts in the propositions. Hence, while it is possible that a student's prior technology use could facilitate students' concept mapping to a certain extent, its preeminence in all aspects of concept map construction cannot be assumed.

Generally, computational concept mapping requires different skill sets compared to paper-based concept mapping. This leads to the postulate that students' knowledge about these skill sets will facilitate their concept mapping using computers. From a constructivist perspective, students' previous knowledge in technology use provides them with scaffoldings for their concept mapping using computers (Bada, 2015; Rintaningrum, 2008).

Although Cmap is relatively easy to manipulate as a computational concept mapping tool, the students who were more experienced in using keyboards, the mouse, software manipulation, saving the concept maps, etc. seemed to have an advantage when using technology to construct their concept maps. They could also understand the software instructions more quickly as they were familiar with the icons used in it. In contrast, those with less experience in technology use might take more time to understand the features of the software. In short, previously learned technological skills helped students to understand the features of the Cmap software and to manipulate them for concept map construction.

6.2.4 The affordances of Cmap

The data indicate that the students in this study were able to exploit some of the affordances of Cmap, which was the concept mapping software used in the reading course. Cmap was designed to help create the visual representation of students' knowledge structures. Within the scope of this study, "affordances" refers to the properties of the software that show the actions that can be taken. The Cmap affordances include assisting students to visualise their text comprehension, identify possible knowledge gaps, revise their knowledge, and foster collaborative learning environments.

Most of the students' learning journals (20 out of 23) indicated that Cmap was an effective software for visually representing their text comprehension. The following excerpts are from Le Xuan's and Manh Tien's learning journals:

> *Cmap help me present my understanding of the text on the concept map. My understanding was clearly presented on the concept maps.* (Le Xuan, Learning Journals, EG, Week 1)

> *When I used this software* [Cmap]*, I could present what I understood about the text on the map of my ideas. It was like picturing my thoughts. I could see my thinking clearly when I look at the concept map.* (Manh Tien, Learning Journals, EG, Week 1)

These students also claimed that Cmap was a useful tool because it allowed them to explain their thinking by presenting their text comprehension visually as indicated by Manh Tien in his interviews:

> *The software was very interesting because I could summarise my understanding of the text in a picture, not in words as what I had done. For Cmap, I just put the key words and arranged them to map out the content of the text. I could see my thoughts through because picture can say more than words sometimes.* (Manh Tien, Interviews)

Manh Tien indicated that Cmap was an interesting software because it allowed him to visually summarise the text content and use it to explain his thoughts. A visual summary presents the text content through images or charts, while a textual summary presents the text content in words.

Consistent with data from students' learning journals and interviews, classroom observations also suggest that Cmap could effectively represent the students' text comprehension because it can visually present on the concept map what they understand about the text. The following observation field notes are from week 1:

> *Students were asked to construct concept maps based on a text about family… Students were observed to spend time on reading the text first and then they started building concept maps using Cmap. I noticed that in the concept maps, students involved main ideas of the text such as Isabel's boyfriend, Isabel's father, stepmother, and her brother. This information was presented in different in different concept maps.* (Observation Fieldnotes, EG, Week 1)

In an educational context, knowledge visualisation is believed to be no less crucial than knowledge itself, as it is likely to influence students' intellectual performance (Tergan & Keller, 2005). Visualising may help students with organising and reorganising, structuring and restructuring their knowledge. Presenting knowledge visually can also help students evaluate, elaborate and communicate their ideas and thoughts about relevant contents and resources. Moreover, visualisation of knowledge may help students overcome problems associated with the limitations of working memory and both the capacity and duration of stored information (Ishai & Sagi, 1997). Consequently, knowledge visualisation may reduce students' cognitive load (Novak & Canas, 2007) and expand their memory capacities for coping with tasks that have complex cognitive requirements (Tergan & Keller, 2005). In terms of students' preferred learning strategies, visualisation is particularly effective for students who prefer a visual strategy to a verbal strategy (Dansereau, 2004). A visual learning tool may help students who have visual learning preferences to summarise texts, recall information, and structure their understanding.

By allowing students to visualise their thoughts, Cmap can help them elicit their thinking, present their knowledge structures and check for misconceptions (Derbentseva et al., 2008; Moru, 2007). Djanettea and Fouad (2014) described concept maps as the "window on the

brain" (p. 583) that can identify students' epistemological obstacles. In the current study, Nhu Quynh described her concept mapping process as constantly revising the propositions:

> *We were asked to build a concept map about long-lived people… I put the sentence "long-lived never drink alcohol" in the concept map as I have always believed that long-lived people never consume any alcohol. After reading the text, I found that long-lived people sometimes drink wine, too. So, I changed the sentence into "long-lived people sometimes have some wine".* (Nhu Quynh, Learning Journals, EG, Week 4)

Nhu Quynh had previously thought that long-lived people never consumed alcohol; therefore, she put the proposition "long-lived people never drink alcohol" in the concept map. Through reading the text and building the concept map, she found that "never drink" was an inappropriate relationship to connect the concept "long-lived people" and "alcohol". She realised that this proposition indicated her naïve understanding of long-lived people. She also found that "sometime drink" could be a more precise relationship that linked the concepts "long-lived people" and "some wine". Nhu Quynh thus revised the proposition "long-lived people never drink alcohol" into "long-lived people sometimes drink some wine". This excerpt illustrates how building concept maps can help students see the connections between concepts more clearly, evaluate their understanding, and identify appropriate relationships between concepts.

Data from the interviews also suggest that visual representations of concept mapping helped the students understand the relationships between the concepts. For example, Quynh Thu said:

> *I often revise the concept map before submitting it. I tried to check the information in all the sentences in the concept map. If a sentence sounds inappropriate, I tried to make changes to make it sound better. After revising the concept map, I could understand the relationships between the concept much better.* (Quynh Thu, Interviews)

Quynh Thu said she could see the relationships between the concepts more comprehensively through revising the concept maps and thus could use more accurate relationships to connect concepts. In this way, students were able to identify and revise inaccurate propositions by using more precise relationships for the bridging concepts.

According to Tergan and Keller (2005), visualisations can enhance processing ability by allowing abstract relationships between elements to be seen, and they may serve as a basis for externalised cognition. In this study, Cmap was a useful tool for the students to visualise their understanding of the reading texts as semantic networks of concepts connected by relationships. It helped them elaborate and analyse the relationships between the concepts in the propositions, and by comparing the information in the propositions with that conveyed in the reading texts, they were able to evaluate and revise the propositions. If a proposition conveyed an inaccurate piece of information, the students could find a more precise relationship to connect the concepts to make the proposition more appropriate.

As a visual representation of students' knowledge, concept maps can help them actually 'see' their understanding of the reading text. Moreover, concept maps also help students keep track of their thinking process (Cassata & French, 2006). Students are able to recognise their misconceptions through their concept maps (Karbalaei, 2011). Consequently, concept mapping is crucial to students' cognitive development.

In concept mapping, students' knowledge of a domain is presented in the form of the propositions (Kinchin et al., 2019). Frarjami (2020) identified misconceptions as incorrect propositions or the missing or faulty links between concepts. While arranging these propositions visually on the concept maps, students can compare the propositions in the concept maps with the information in the reading text and identify incorrect propositions between concepts, thus detecting their misconceptions. When students realise their misconceptions, they will try to rectify them to avoid systemic errors in thinking.

In this study, by externalising the students' thinking processes, Cmap helped them see how concepts were related to each other. While arranging the concepts on the concept map, the students could build up the connections among them. By visually presenting the students'

thoughts, concept mapping allowed them to develop their systemic thinking and structural knowledge (Jonassen, 2009).

Moreover, this finding that Cmap could help the students visualise text comprehension is supported by the Dual Coding Theory (Paivio, 2006; Sadosski & Paivio, 2013). The core concept of this theory is that ideas can be presented verbally and nonverbally. Verbal and nonverbal processing are mutually related to each other, as verbal stimuli can activate nonverbal processing and vice versa. Sadoski and Paivio (2004) claimed that utilising both types of processing can maximise students' cognitive process in reading comprehension because they make use of both linguistic and nonlinguistic cues from the text. In the current study, Cmap allowed the students to include both verbal and non-verbal processing in the concept maps. The combination of both textual and visual information helps them make their thinking explicit.

Another affordance of Cmap mentioned by the students was that it included two concept mapping modes they could use to scaffold their map constructions. The default mode had the basic tools, while the advanced mode had features such as customising the nodes or links and inserting photos and videos into the concept map. Data from the students' learning journals show that most students (17 out of 23) believed that Cmap's default mode was user friendly and easy to use. For example, Kim Phuong wrote:

> *For me, I quite enjoyed drawing concept maps because the software was quite simple: the instructions were shown through the icons, so it just took me few minutes to understand how to use the software. Plus, we had some options for the concept maps to choose from, such as the nodes, the links or the map patterns. All these made my building concept maps easier.* (Kim Phuong, Learning Journals, EG, Week 1)

Kim Phuong explained that Cmap was user friendly because its instructions were presented in the form of icons, and therefore she quickly learned how to use the software. As well, the

software was easy to use because it included options (e.g., nodes, links, map patterns) that facilitated her map construction.

Similarly, other students revealed that the manipulation of Cmap was easy. For example, Ha Nga reported:

> *In the first week, I learned to use the software. It was quite easy to me. What I learned was clicking, dragging and dropping. On the computer screen, there was a side window from where I dragged the nodes and the links to drop onto the main concept mapping window.* (Ha Nga, Learning Journals, EG, Week 1)

Ha Nga explained that Cmap was an easy-to-use software as it included simple drag-and-drop operations. When the students opened the software, there appeared on the computer screen a side window containing the available nodes and links. To construct a concept map, the students could drag the nodes and the links from the side window and drop them onto the main window.

Congruent with the data from the students' learning journals, some of the interviews (eight out of 12) also indicated that Cmap was an easy-to-use software that helped them construct their concept maps quickly. The following is an extract from Ha Nga's interview:

> *I quite liked using Cmap. It was easy to use. In fact, I am not very good at technology and I haven't known about concept mapping before. But I could understand how it* [Cmap] *worked quickly because the icons in the task window were the same with the icons in Microsoft Word. To construct the concept map, I just picked the nodes and the links from the task window to put on my concept map.* (Ha Nga, Interviews)

Consistent with the data from her learning journals, Ha Nga stated in this interview that Cmap was a manageable software because it provided instructions through a system of icons similar to those used in Microsoft Word. She said she could construct her own concept map the first time she used it, even though she was not an expert in technology. To construct the map, she would pick the nodes and the links from the side window to drop onto the main window.

Classroom observations revealed that the students tended to use the default mode in the first weeks of the reading course and the advanced mode later in the course. The following two excerpts are from observation field notes made in weeks 1 and 5 respectively:

> *Students started to learn how to use Cmap and they seemed excited ... They dragged the available nodes and links in the side window and dropped them onto the main window to construct their concept maps.* (Observation Field notes, EG, Week 1)

> *Students were asked to construct concept maps about haunted houses in England. While some students picked up the available nodes from the side windows, some other students used the advanced mode to customise their concept maps. Some students made changes to the node background, some others made changes to the links or inserted images into the concept map.* (Observation Field notes, EG, Week 5)

Consistent with these data from the classroom observations, the students also wrote in their learning journals about their use of the advanced mode in week 5:

> *This week, I learned to use some interesting features of Cmap such as I changed the nodes and the links to make them look what I wanted, I changed the size and the font of the words in the nodes, I also changed the color of the words. My concept map looked my style, very colorful.* (Hai Chau, Learning Journals, EG, Week 5)

> *I just tried new things today. After I could use the available things, it was not too difficult if I want to make changes to the nodes and the links because I got used to the interface of the software. I changed the lines into the arrows to fit the relationships between the key words.* (Duong Hien, Learning Journals, EG, Week 5)

In their learning journals, both Hai Chau and Duong Hien revealed that they used the advanced mode for concept mapping. In particular, they changed the designs of not only the nodes and the links, but also the text in the nodes. Duong Hien wrote that the default mode helped facilitate her use of the advanced mode. She explained that after using the default mode, she became used to the software interface and found it easier to use the advanced mode.

Aligning with these data from their students' learning journals, the students' interviews show they used both modes of concept mapping. For example, Duong Hien said:

> *I enjoyed using both modes of concept mapping. In the first few weeks when I tried to get used to concept mapping, I just dragged things from the side window because it was quite easy; the nodes and the links were available for me to pick. After a few weeks, I learned to make my*

concept map more interesting. It was not very difficult to learn the advanced mode because I based on what I learned from dragging things. (Duong Hien, Interviews)

Duong Hien explained that she first used the default mode because it was easy to use as a beginner. After mastering this mode, she used the advanced mode to customise her concept maps. This illustrates how Cmap provided the default mode as a scaffolding system to facilitate concept map construction. For the novice mappers in this study, the default mode provided them with available nodes and links so that their maps could be constructed based on simple drag-and-drop operations. In this way, the students with little prior experience in concept mapping could construct maps by themselves. Based on this experience, they could progress to the advanced mode without being overwhelmed by the cognitive load. In other words, by providing the two modes, Cmap helped the novice mappers become advanced mappers.

This finding that Cmap facilitated students' concept mapping through the scaffolding system of the default and advanced modes supports Canas et al.'s (2004, p. 3) claim that the key feature of Cmap tools is "low threshold, high ceiling". "Threshold" refers to how difficult it is to learn to use Cmap tools, and "ceiling" refers to how much can be done using Cmap. This description suggests that while Cmap software is both easy to learn and use, it also provides an environment that supports the construction of advanced concept maps.

In this study, the interface of Cmap was user friendly because the instructions were represented by icons, which helped the students learn how to use the software quickly. At the same time, Cmap allowed them to construct maps with advanced features by customising nodes, links, fonts and text sizes etc. In other words, the software's user interface and functionality were easy to use for naïve users who did not have much technical expertise. Nevertheless, it was powerful enough to support the advanced requirements of the more expert students, some of whom mentioned that Cmap's advanced mode allowed them to add the links of external

resources to their concept map to illustrate the concepts. The following excerpts are from

Khanh Huyen's and Quynh Thu's interviews:

> *When I drew the concept maps, I sometimes added photos to the concept map. This helped to add more information to the concept map and made it more interesting.* (Khanh Huyen, Interviews)

> *I remember that I started to learn to make changes to the nodes and links in week 3. At first, I just made some simple changes to the concept map such as changing the font and the size of the text. Then, in week 4, I tried to add pictures, videos and things into the concept map. All these things helped me say more about the concepts and made concept mapping more fun.* (Quynh Thu, Interviews)

These students believed that Cmap helped them communicate their ideas better by allowing them to use alternatives for presenting the concepts. Instead of merely using textual concepts, they could also use visual forms (images, videos). In Quynh Thus's learning journals, she revealed that she learned to insert images and videos into the concept map in week 4 and that that using these alternatives to textual concepts could make her concepts more informative, communicative and detailed:

> *This week, I learned to makes changes to the nodes and the lines. I also could insert photos and videos into the nodes. These things made my concept map detailed.* (Quynh Thu, Learning Journals, EG, Week 4)

Figure 6.7 is the concept map Quynh Thu constructed in week 4.

Figure 6. 7: *A Concept Map Constructed by an EG Student* (Quynh Thu, Week 4)
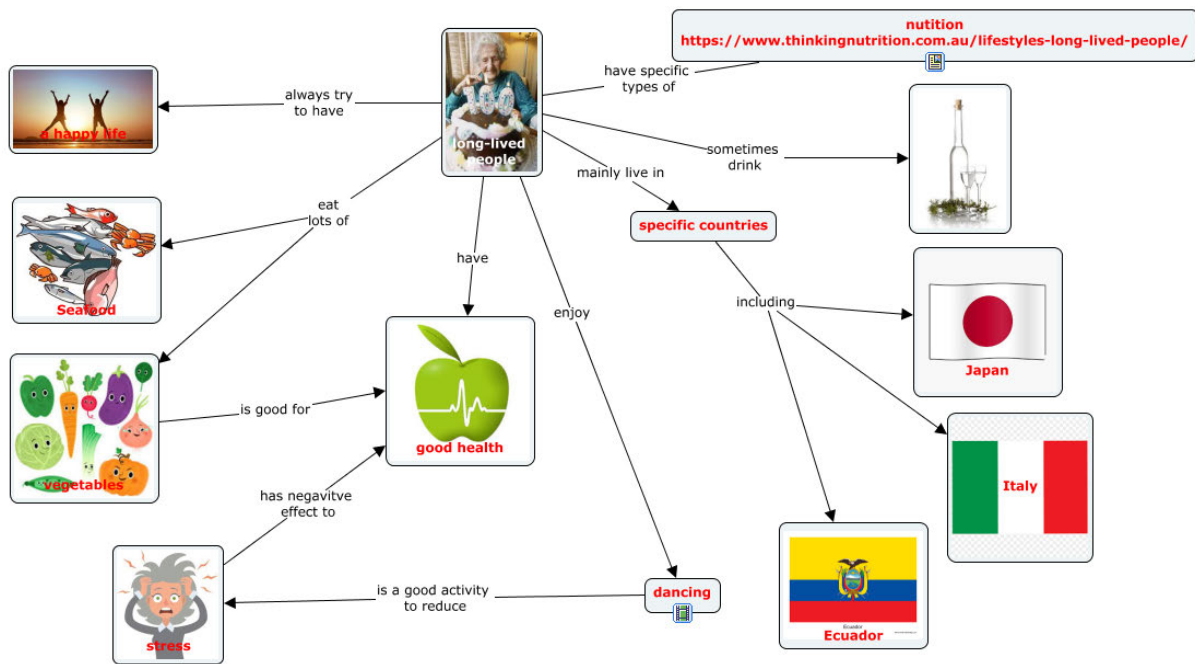
It is obvious that the Quynh Thu used the advanced mode to construct the concept map in

Figure 6.7. She made changes to the node (the font and the size of the text) and the links (using

arrows instead of lines). She also added resources by inserting background images for the

concepts "long-lived people", "a happy life", "seafood", "vegetables", "stress", "good health",

"grappa", "Japan", "Italy" and "Ecuador", and by adding a link to a website for the concept

"nutrition" and a video clip to further elaborate the concept "dancing".

The classroom observations also report the students inserting external resources into the

concept maps by week 4:

> *A group of students sitting close to me was curious about the advanced mode. They were heard asking each other how to use the advanced features of Cmap. Then they practised some of the advanced features in their concept map such as inserting phots, videos, etc.* (Observation Field notes, EG, Week 4)

Cmap allowed these students to communicate more effectively using both textual and visual

communication to create multiple representations for the concepts. The use of multiple

representations for concepts is supported by Cognitive Flexibility Theory (Lee, 2014; Rhodes

& Rozell, 2017; Spiro et al., 2003; Spiro & Jehng, 1990). According to Spiro and Jehng (1990), cognitive flexibility refers to "the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands" (p. 165). Spiro et al. (2003) argued that since the transfer of knowledge is a non-linear and multi-faceted process, it is necessary that information be presented from multiple intellectual perspectives: "Whenever one sees a complex situation with a different conceptual 'lens' or from a different perspective, new and important features of the situation are revealed" (p. 6).

In the current study, Cmap allowed for multiple representations of concepts from both textual and visual perspectives. These representations helped the students understand better the complexity of the concepts and increase the communicability of their maps by allowing the information in them to be considered through different "lenses". Moreover, visual representations can add to the information conveyed by the textual representations because they can also be related to students' emotions.

Multiple knowledge representation is crucial in learning because it helps students develop the mental scaffolding necessary for considering new applications of the knowledge in new situations (Cheng & Koszalka, 2016). According to Rhodes and Rozell (2017), multiple knowledge representation can remedy problems associated with advanced knowledge acquisition because it helps students think flexibly and apply the new knowledge to novel contexts, thus achieving deeper learning.

This study found that the participating students were able to take advantage of the flexible editing and updating features of Cmap. As compared to paper-based concept mapping, the students were able to flexibly edit their computer-based maps and thus reduce their cognitive load. The classroom observation field notes recorded this process as constantly adding information and making changes to the concept maps:

During the map construction, students were seen to make many changes to their concept maps, they added more concepts and links, they made changes to the nodes and links, they deleted some concepts. The teacher allowed 30 minutes for map construction and I saw the student sitting right next to me trying to fix his concept map till the last minutes. I saw him changing the topical concept to "houses of ghosts". He added plenty concepts to his concept map and then deleted some. (Observation Field notes, EG, Week 5)

These students spent the 30 minutes allowed for editing and updating their concept maps. As a result of Cmap's flexibility, they were observed to be task-oriented, constantly adding concepts and links and making changes to nodes and the links on their concept maps.

Consistent with data from the classroom observation, the students' learning journals and interviews also revealed that they were able to tap into the flexible editing feature of Cmap. Interestingly, because the students could save time when working on the technical aspects of the map, they seemed to engage more in self-reflection. This is evident in the following excerpts from Thuy Dung's and Thuy Trang's interviews:

Fixing concept maps on Cmap was quite easy. I just clicked what I want to move and dropped it at where I wanted. I made lots of changes to my concept maps because sometimes, I thought that "Oh, I should put this concept", but a few minutes later I changed my mind and thought "No, maybe another concept should be better". (Thuy Dung, Interviews)

I had used concept mapping for my study, but not on the computers. So, when I want to make any correction to the concept map, I had to erase the nodes and the links. The concept map looked really messy because when I erased one node, I had to erase the links as well. Same things happened when I wanted to add the nodes. Now when I was taught to use Cmap, I found it much more convenient because it was much easier. I could make as many changes to the concept map as I wanted, and it did not look messy at all because the links and the nodes could be rearranged easily. I could even put a lot more keywords on Cmap. (Thuy Trang, Interviews)

Both Thuy Dung and Thuy Trang highlighted how Cmap made the revision of their concept maps easier, and how they took advantage of this to engage in self-questioning, which facilitated reflection. Thu Trang compared the features of Cmap with how she had edited her paper-and-pencil concept maps; the computerised process was easier and quicker, and its ability to transcend page size allowed her to include larger sets of concepts on her map.

The teacher asked us to build concept maps about the houses of ghosts. I made so many changes to my concept map. I first had "Haunted houses have scary things", but then I thought that to some people, like ghost hunters, these things might not be scary, it was just unusual. So, I decided

to change it into "haunted houses have strange things". I also changed "The Gosforth Hotel contains a secret tunnel" into "The Gosforth Hotel has a secret tunnel" because I thought "has" is a more suitable relationship between "Gosforth Hotel" and "a secret tunnel" than "contains". I first had just nine key words on the concept maps, then I added six more. I did not have any interconnections, but then I found an interconnection between "the priest" and "room 11". So, I had to move the nodes containing these two key words closer to link them. I also deleted "Gosforth Hotel is a famous hotel" because I wasn't sure about the information. (Thuy Trang, Learning Journals, EG, Week 5)

In this excerpt from her learning journals, Thuy Trang described in detail how she constructed and edited her concept maps. She made many changes to it, such as adding more concepts; changing the links and adding interlinks between concepts; rearranging the nodes and the links; and deleting the propositions. Making these changes using Cmap was easy and quick; however, it would have been a challenge for her if the map had been constructed based on the traditional paper-and-pencil method.

This finding that Cmap facilitated concept map revision aligns with those of other educational researchers such as Asiksoy (2019), Chang et al. (2002), and Liu et al. (2010). Asiksoy (2019) argued that paper-based concept maps are two-dimensional and that revising and adapting them is time consuming and exhausting for students; in contrast, computational concept mapping allows for easy manipulation and revision. Alansari (2010) identified how the page-size transcendence of Cmap facilitates concept map restructuring, as students can add large sets of concepts to communicate their ideas. In the current study, by providing the students with the flexibility to add, remove or edit the available content, Cmap eliminated some of the drawbacks of paper-based mapping in regard to revising and restructuring. This allowed the students to question themselves while revising their concept maps and thus engage in self-reflection.

This study also found that Cmap provided a facilitating environment for collaborative learning. The following excerpt is from a classroom observation in week 6:

The teacher asked students to read the text about travelling in Dublin and construct a concept map. While constructing the concept maps, some students worked together in pairs or small groups. These students were seen to point to other students' concept maps and then discussed. After that, they were seen to make changes to their own concept maps. (Observation Field Notes, EG, Week 6)

This excerpt shows that although these students did not exploit Cmap's affordance of supporting synchronous collaboration, they spontaneously gathered as groups to examine each other's concept maps, engage in discussion, and give feedback to group members. Cmap seemed to encourage them to participate in a collaborative working and learning environment as they constructed their individual maps.

Congruent with these data from classroom observations, the students' learning journals reported that while using Cmap the students discussed their concept maps with their peers:

We were asked to build concept maps about travelling in Dublin. I did not know much about this city, so I asked Quynh Thu; she sat next to me. She looked at concept map and said that I should put some more nodes. And when I looked at her concept map, I thought there might be some link between "the priest" and "the protestants". (An An, Learning Journals, EG, Week 6)

I worked in a group of three: me and two others on my two side. We looked at the screens and discussed about each other's concept map. My classmates said that I should put more nodes about the Comlongon Castle because I only focused on the Gosforth hotel and I should delete the idea "The tunnel was made by the priest" because the text did not say that. We were a great group. I felt that I came up with more ideas after discussing with them. (Hoang Tung, Learning Journals, EG, Week 6)

In their learning journals, both An An and Hoang Tung articulated that they collaborated while constructing their own concept maps. The excerpt from Hoang Tung's journal is consistent with this comment he made in his interview:

During the reading course, I often worked with Thanh Mai and Thu Trang. We discussed about things like what should be added, what should be deleted, what should be changed on the concept maps, etc. I believed that a group of people would have more ideas than just one person… I felt happy because I made something to my classmates' concept maps. (Hoang Tung, Interviews)

This comment illustrates the advantages of shared cognition in collaborative work. Shared cognition is the process in which two or more people intertwine their thoughts (Barron & Roschelle, 2009). It can lead to co-authorship of the intellectual accomplishments. Hoang Tung

acknowledged that when he worked with his peers, they would give him advice and suggestions on his concept map. He would have more ideas after these discussions, and he enjoyed contributing to his peers' concept maps. This is an example of collaboration leading to ownership of learning.

This finding strongly supports those of Canas et al. (2003) and Lee (2014). Canas et al. (2003) used to the term "knowledge soup" to refer to students' co-authorship of their concept maps. During concept mapping, students discuss and exchange ideas that contribute to the co-ownership of their shared works, despite the fact that they produce their own concept maps. Also, through the process of collaborative working, students can give peer feedback on each other's work. Therefore, they are able to challenge ideas and determine the validity of the claims made.

Working collaboratively promotes ownership of learning by allowing for co-authorship of the content (Lee, 2014). Similarly, by analysing and evaluating the appropriateness of their co-authored work students can improve their collaborative work. This process requires a high level of concentration on reading and comprehending the content.

Although collaborative learning was not a part of the prescribed CCMAL activity in the current study, the students took their own initiatives to work with their peers. By implementing their concept map constructions as group tasks, the students resolved emerging problems in ways they could not have done individually. Lee et al. (2021) claim that adaptive learning can emerge when students devise their own ways to cope with the challenges of concept mapping.

In summary, this study found that the affordances of Cmap generally influenced the participating students' CCMAL learning experiences. In particular, Cmap was an effective visualising tool for representing the students' text comprehension, eliciting their knowledge structures, and diagnosing their misconceptions. Underpinned by the Dual Coding Theory,

Cmap makes use of both textual and visual processing as it allows students to arrange concepts graphically (Paivio, 2006; Sadosski & Paivio, 2013; Schwendimann, 2014). Similarly, Bruillard (2004) has asserted that concept maps allow students to present concepts in both textual and visual forms. Instead of merely using texts for presenting a concept, students could use images or videos as alternatives.

Cmap's "low threshold, high ceiling" (Canas et al., 2004) ensured that the software could be used by the novice students and still provide enough advanced tools for those more expert. Its default and advanced modes scaffolded concept mappers of different levels. In particular, the low threshold assisted the beginners to construct concept maps (Myers et al., 2000).

Moreover, Cmap allowed the students to insert images, videos and other additional resources into their concept maps as alternatives to the textual representation of concepts. This affordance of Cmap is aligned with the Cognitive Flexibility Theory, which assumes that knowledge can be presented and considered from different perspectives and that multiple knowledge representations help students understand the complexity of the concepts (Gruber, 2001; Lee, 2014; Rhodes & Rozell, 2017; Spiro et al., 2003). Chaka (2010) argued that presenting concepts in both textual and visual forms can make concept maps more informative. In addition, Cmap facilitated concept map construction and revision by providing the students with the flexibility to add, remove and edit the available content, thus eliminating the drawbacks of revising and restructuring that occur in traditional paper-based concept mapping.

Finally, there is evidence of Cmap facilitating collaborative working. It enhanced communication among peers; the students could obtain precise information by showing each other their concept maps on the screen and then discussing them. Collaborative concept mapping promotes the ownership of learning by requiring concentration on the reading and

understanding the content in the co-authored work. During their collaborative concept

mapping, the students analysed and evaluated the information in their shared work.

6.3. Chapter conclusion

With respect to the aim of research question 3, which was to identify the possible factors that

influence students' experience in CCMAL learning, this study found that the participating

students' CCMAL learning experiences were influenced by

1. the relevance of the students' prior experiences to the topics of the reading texts;

2. the students' prior knowledge of concept mapping;

3. the students' prior knowledge in technology use; and

4. the affordances of Cmap, the concept mapping software used in this study.

First, this study found that the more the text content was relevant to the students' prior, real-

world experiences, the better was their concept mapping. In addition to the textual information,

the students used their prior knowledge about the topic of the text as a source of information

for their concept maps. Moreover, the relevance of the students' prior experience to the text

topics influenced their personal preferences for the text topics. The students preferred topics

related to their daily life experiences to topics they did not have much background in. Hence,

text topics that were familiar to the students' real-world experiences facilitated their concept

mapping.

Second, the data suggest that the students' prior knowledge of concept mapping influenced

their experience of learning CCMAL. As a novel learning tool, concept mapping requires

specific skills such as identifying and connecting key concepts in the text and arranging these

concepts on the map. Prior experience in concept mapping shortened the time required to learn

these skills and facilitated the students' map construction.

Third, the students' CCMAL learning experiences were influenced by their prior knowledge of technology use. Digital concept mapping requires both general concept mapping skills (e.g., identifying key concepts, identifying relationships between concepts, etc.) and technological skills (e.g., using the keyboard, using the mouse, saving the file, etc.). From a constructivist perspective, the students' concept mapping using Cmap was facilitated by their prior knowledge in these skill sets.

Finally, the affordances of the Cmap software also influenced the students' CCMAL learning experiences in several ways. First, Cmap was useful for eliciting the students' thinking because it allowed them to visualise their knowledge structures. Second, it provided the students with a system of scaffolding in the form of default and advanced concept mapping modes that were suitable for both novice and expert mappers. Cmap does not require students to have specific technical skills and knowledge, although it can provide them with a range of options powerful enough for experts. Third, Cmap encouraged multiple knowledge representation by allowing the students' visual representations of concepts to be inserted into the concept maps. This is supported by Cognitive Flexibility Theory, which posits that multiple knowledge representation can help students understand the complexity of a concept by considering it from different perspectives. Moreover, revising digital concept maps using Cmap was easier for the students because it allowed the flexibility of adding, editing and removing information. Cmap also facilitated the students' collaborative concept mapping and co-ownership of the shared works by allowing them to show their maps on the screen to each other and then discuss them. Collaborative concept mapping also helped the students determine the validity of their claims by submitting them to analysis and evaluation by their peers. Chapter 7 will conclude this thesis. It will present the results, significance and limitations of this study. It will also recommend further relevant research into EFL teaching in general and EFL reading comprehension in particular.

CHAPTER 7: CONCLUSION

7.1 Thesis summary

This thesis reports on a convergent mixed method research study of the influence of computational concept mapping in an authentic learning context (CCMAL) on student metacognition in reading comprehension classes at a Vietnamese university. Conducted in the winter of 2018 (academic year 2018 – 2019), participants were first-year undergraduate students (n = 100) who had chosen English as their non-major subject and whose average age was 19 years. The students were assigned into two groups of 50: a control group (CG) and an experimental group (EG). They participated in a 2-hour session of reading comprehension on a weekly basis during a 7-week reading course. The EG was exposed to CCMAL and the CG to traditional teaching methods.

The three research questions of this study are:

1. How does CCMAL influence students' reading comprehension?

2. How does CCMAL influence students' metacognition?

3. What are the possible factors that influence students' concept mapping?

Data were collected before, during and after the reading course. Before the reading course, both groups were asked to complete a survey on metacognition and to sit for a pre-test on reading comprehension. During the course, they were encouraged to write weekly learning journals, with the EG also asked to submit concept maps in weeks 1 (CM1), 4 (CM2) and 7 (CM3). Upon completion of the course, both groups completed a post-survey on metacognition and a post-test on reading comprehension. Twelve of the EG students were selected for individual interviews after the reading course.

Data were analysed quantitatively and qualitatively at the same time. Descriptive analysis of the quantitative data identified the influence of CCMAL on the students' reading achievements and metacognition. Thematic analysis of the qualitative data focused on how CCMAL influenced these reading skills and metacognitive strategies.

7.1.1 Students' reading comprehension and CCMAL

Regarding research question 1 – "How does CCMAL influence students' reading comprehension?" – this study found that EG students' reading performances improved as a result of their reading course. Before the reading course, their average score on reading comprehension was M = 5.43 (n = 44). After the course, this score improved significantly to M = 6.95 (n = 44) (p = .00 < .05). In addition, these students' scores on reading comprehension were found to be correlated with their scores on concept mapping in weeks 4 and 7 (p = .00 and .00, respectively). Moreover, multiple regression showed R^2 = 76.5, indicating that the students' scores on their concept maps collected in week 4 (CM2) and their concept maps collected in week 7 (CM3) could explain the 76.5% variance of their reading comprehension scores. This indicates that CCMAL had a positive influence on the EG students' reading achievements.

This study also found that the EG had better reading achievements compared to the CG. While there were significant differences in the EG students' reading comprehension scores before and after the reading course (p = .00 < .05), there were no significant differences in the CG students' scores (p = .06 > .05). Furthermore, the mean difference between EGs' before and after scores on reading comprehension was M = 1.52, which is higher than that of the CG at M = .11. These results indicate that CCMAL had a significant influence on the EG students' academic achievements compared with the traditional approaches offered to the CG.

Notably, this study found that CCMAL had increasing influence on the EG students' reading comprehension from the second half of the reading course. In particular, their scores on reading comprehension were correlated with their scores on CM2 and CM3 However, their reading scores were not correlated with their scores on their concept maps collected in week 1 (CM1). This implies that curriculum designers should allow sufficient time for CCMAL instructions to influence students' learning. This is further discussed in Section 7.3.

The qualitative data showed that the students of both groups developed a range of reading skills, including literal comprehension (skimming for general ideas and scanning for detailed information) and interpretive comprehension (connecting ideas). However, only the EG students developed the skill of inferential comprehension. Specifically, they developed the skill of contextualising unknown words; that is, they could predict the meanings of unfamiliar words based on words in the text they already knew. They constructed semantic networks of concepts by arranging the concepts on their maps in the form of propositions. The information presented visually in these semantic networks allowed them to infer the meanings of the unknown words.

The EG students also contextualised the unknown words based on their prior knowledge and experience. The concept maps allowed them to add new concepts based on previously known concepts. Information conveyed in the familiar concepts could then activate the students' schemata and thus facilitate their prediction of unfamiliar words. The concept maps also helped them see the relationships between the concepts more clearly. Through knowledge visualisation, they were able to elaborate on the relationships between concepts, especially the abstract relationships. They could then reflect on what they had learned or experienced to evaluate the propositions and predict unknown words.

7.1.2 Students' metacognition and CCMAL

In regard to research question 2 – "How does CCMAL influence students' metacognition?" – this study found that CCMAL had a positive influence on students' metacognition. The mean difference between the EG students' pre- and post-course scores on metacognition was M = .37 (n = 43); the P value at .00 (<.05) indicates a significant difference between their scores on metacognition before and after the reading course. These scores were shown to be correlated with their scores on their concept maps in weeks 4 and 7 (p = .01 and .00, respectively). And the multiple regression showed that R^2 = 64, meaning that 64% of the variance of the students' scores on metacognition can be explained by their scores on concept maps. These results indicate that CCMAL had a positive influence on the EG students' metacognition.

Although the CG students' reading comprehension also improved, the mean difference at M = .20 (p = .06 > .05) implies no significant difference between their scores on metacognition before and after the reading course. This indicates that the students exposed to CCMAL had better achievements in reading comprehension than the control group.

The qualitative analysis found that CCMAL enhanced the EG students' use of a variety of metacognitive strategies during the pre-reading, while-reading and post-reading phases. In the pre-reading phase, they used planning strategies to facilitate their reading comprehension. In particular, CCMAL helped them anticipate the text content. Concept map construction starts with a focus question aimed at identifying the topical concept of the map. To answer this question, the students would search the key concepts in the text and be led to a specific domain. Anticipation of text content could thus stimulate their interest and help them set the purposes for reading. This indicates that the concept mapping using CCMAL facilitated their reading comprehension.

While reading the texts, the students used different metacognitive strategies to monitor and improve their comprehension. One strategy they used to understand the text better was thinking aloud. Verbalising their internal thoughts during text comprehension helped them stay focused on the text and then summarise it.

Concurrently with thinking aloud, the EG students use self-questioning. They spoke aloud the questions they had for themselves about text comprehension and map construction. The map construction activity allowed them to build their own concept maps based on how they understood the reading text. There were no specific models to follow. During map construction, self-questioning allowed them to restate and explain to themselves the problems they were having, and to justify the solutions. Self-generated questioning thus helped the students focus on important information and enhance their interactions with the text.

The study also found that CCMAL encouraged the EG students' use of self-regulated learning strategies such as mental imagery about the concepts in the text and help-seeking while reading. The mechanism of imagery is supported by Dual Coding Theory (Paivio, 2006), which suggests that there is a mutual relationship between verbal and nonverbal representations of information: mental images are stimulated by textual cues, and the textual information stimulates the visual information. This combination of both visual and verbal coding allowed the students to process information more effectively, the imagery helping them fill the gaps in the written text in order to make inferences from their prior knowledge and experience, and thus make a complex problem more manageable. When connected, these separate images would contribute to a student's broader picture of ideas. The concept would activate the student's schemata, in which concept-related pictures are stored.

Insufficient vocabulary was the major problem in text comprehension for all the students. This study found that CCMAL enhanced the EG students' instrumental help-seeking and reduced

their executive help-seeking; they were observed to spend more time on solving problems by themselves and to rely less on the help of teachers and classmates. Although such help might have given them the answers quickly, it might also have interfered with their long-term autonomy. CCMAL helped them contextualise unknown words. By reading the text using concept mapping, they were able to guess the meanings of the unknown words. They could then spend more time predicting the meanings of unfamiliar words instead of asking teachers or classmates for the answers. As they reduced their reliance on others, they became more independent and self-initiating as learners.

7.1.3 Factors that influenced students' concept mapping

In response to research question 3 – "What are the possible factors that influence students' concept mapping?" – this study identified three main factors that influenced how the EG students constructed their concept maps: the topic of the reading texts; the students' previous knowledge of concept mapping and technology use, and the affordances of the concept mapping software.

First, the relevance of the topics of the reading texts to the students' daily life experiences heavily influenced their concept mapping and text comprehension. When the text topic was close to the students' background, they were able to understand its content better because they could use their prior knowledge and experience to compensate for their language inadequacy. The EG students constructed their concept maps based on their understanding of the text; the more they comprehended the text, the better they constructed their concept maps. In summary, familiar reading topics facilitated the students' concept mapping by enhancing their text comprehension.

Second, the EG students who had previous knowledge of concept mapping before the reading course were able to perform better at it than those without prior knowledge. Concept mapping

demands the manipulation of a wide range of skills, such as identifying key concepts and connecting and arranging them on the map. These are different from traditional reading comprehension skills. Concept mapping also changes a reader's way of thinking since the whole picture of a knowledge domain may be seen. The students with previously learned skills in concept mapping manipulated their maps more easily.

In addition, since computer-aided concept map construction requires technological skills, a student's background in technology can facilitate their use of CCMAL. From a constructivist perspective, this IT knowledge would have reduced their cognitive load as they built their computational concept maps.

The fourth factor that influenced how the EG students constructed their concept maps: the affordances of Cmap. Most of the EG students reported that Cmap was an effective tool for visualising their knowledge. According to Tergan and Keller (2005), knowledge visualisation can influence intellectual performance by helping students organise and structure their knowledge and overcome problems related to the limitations of working memory for information storage capacity and duration. By decreasing cognitive load, it increases students' capacity for handling tasks with complex cognitive requirements.

Cmap was also useful for diagnosing the EG students' misconceptions. By visually presenting their knowledge, the concept maps helped them not only see the relationships between concepts more clearly but also identify the gaps in their understanding through elaborating and evaluating the propositions. When the students found an inaccurate relationship between concepts, they would search for a more precise one to connect the concepts.

The current study also found that Cmap facilitated the students' concept map revision. Students could easily make changes to their concept maps by adding concepts; changing links and adding interlinks between concepts; rearranging nodes and links; and deleting propositions. By

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providing students with this flexibility, Cmap eliminated the restructuring drawbacks of paper-based concept maps. Revision also engaged the students in self-reflection through self-questioning.

Interestingly, concept mapping with Cmap also facilitated the students' collaborative working. Although the students constructed individual concept maps, they tended to work in pairs or in small groups to discuss each other's maps. Collaborative working allows for the co-authorship of the content, thus promoting ownership of learning as students analyse and evaluate the appropriateness of their co-authored work (Lee, 2014). Cmap encourages the high level of concentration on reading and comprehension required by this process.

7.2 A conceptual framework explaining student's EFL reading comprehension in CCMAL

The role of metacognition in EFL reading comprehension has been acknowledged by many researchers. Metacognition helps students become consciously aware of comprehension processing. Reading strategies introduced by a teacher may fail unless students are aware of their comprehension break-down and what they can do about it (Karbalaei, 2011). Moreover, Baker (2008) has suggested that metacognition enables students to recognise when they have learned something useful and how to progress using it. Metacognition includes the reasoning process; hence, when readers are conscious of the reasoning strategies involved in reading, they can access and apply them to solving future similar comprehension problems.

Metacognition can be impacted by the learning environment; therefore, it is essential to apply positive teaching methods that enhance learners' metacognition. Researchers have suggested that concept mapping can reinforce students' metacognition in the context of reading comprehension classes (Kalanzadeh et al., 2014; Tajeddin & Tabatabaei, 2016; Trang, 2017; Usman et al., 2017). As an advanced and effective way of organising and representing ideas,

concept mapping can develop students' metacognitive awareness, which is important for their selecting appropriate reading comprehension strategies (Nosratinia et al., 2013; Novak, 2004). Furthermore, concept mapping can make the learning process more meaningful by connecting new information to prior knowledge (Kalhor & Mehran, 2016; Trang, 2017).

According to Canas et al. (2003), concept maps allow students to think deeply about concepts and store information more effectively in their memory, and they can be effective for promoting creative thinking and identifying new problem-solving methods. Moreover, they help students visualise the relationships between the main concepts and thus allow them to focus on key concepts and ideas instead of being distracted by detailed information in the text (Tajeddin & Tabatabaei, 2016).

Computational concept mapping addresses the limitations of paper-and-pencil concept mapping in the correction process and when presenting a large number of concepts (Liu et al., 2010; Wang et al., 2014). Wang et al. (2014) found that in the paper-and-pencil technique, paper size limits the number of concepts that students can show. In contrast, concept maps created using technological platforms permit a large number of concepts, and thus students can extend their concept maps to fully present their ideas. In addition, computer-based concept mapping makes correction easier than paper-and-pencil mapping because it allows students to quickly add, correct, or delete nodes and the links (Liu et al., 2010). Asiksoy (2019) adds that computer-based concept mapping is more convenient for communicating with peers because students can obtain precise information by showing their maps to each other on the screen and then discussing them.

In summary, the findings of this study suggested the conceptual framework showing how students' metacognition and EFL learning are facilitated by computational concept mapping when reading topics are familiar to their authentic, real-world experiences. Computational

concept mapping can also enhance authentic learning by visually representing students' prior knowledge and daily-life experiences and by connecting their prior knowledge to new information.

7.3 Significance of the project

The preceding chapter provided a critical analysis of the current situation of English language teaching and learning in Vietnam wherein several inefficiencies were noted. Given how the Vietnamese government, as its main education policy, sees the use of foreign languages, primarily English, as strategic tools to foster the country's development and integration, it is paramount to develop concepts on how to address these inefficiencies to improve the general quality of English teaching and learning throughout the country.

This project aims to explore the use of innovative strategies in teaching methods and techniques and proposes that if CCMAL is adopted into the current English language teaching and learning at a Vietnamese university, the technique could materially affect the EFL learners' metacognition. In other words, it is of the nature of teaching the language, as if the student is learning his first language. Learning English in this way makes them speak the language as if it was their native language.

The association of metacognition as predictor of success in a human's ability to learn had been explored in the past. According to Karbalaei (2011), readers who monitor their reading and their state of learning in terms of using strategies, adjusting effort appropriately and evaluating the success of ongoing effort to understand a text are more successful. On the contrary, poor readers are less able to identify the meaning-related purpose of reading and to explain the information embedded in text features (Kraayenoord, 2010).

The determination of how the use of a new teaching method – CCMAL – can influence EFL learners' metacognition is significant and is anchored based on the following sub-propositions, to wit:

First, CCMAL can positively influence EFL students' metacognition in the Vietnamese context. The use of CCMAL can motivate Vietnamese students in learning more about the English language. The scheme facilitates the adoption of English albeit a foreign language as parallel to the student's native language.

Second, students' reading comprehension plays a crucial role in their successful EFL learning. The English language is considered the universal language as it is widely spoken by many people around the world. Several countries also consider English as their official language, so most of the world's literature are in English. Most academic journals or studies across the globe are written in English. Very rarely, that these journals are translated in a local language. For non-native English speakers, it therefore becomes essential to be able to understand and comprehend English to be able to communicate and engage with people around the world.

Third, the findings of this study of Vietnamese students' use of CCMAL in EFL reading classes have meaningful implications for policy makers and for educators who design and develop EFL programs, especially at the tertiary level. The success of the Vietnamese government's push on EFL learning rests on the effectiveness of the methods used in teaching EFL to the learners. The findings in this project on the adoption of CCMAL can contribute to the overall effectiveness of the academic programs in line with the direction of the government.

Fourth, theoretically, the project adds to the growing body of research on EFL conducted among Vietnamese students. Concept mapping in EFL classes has been investigated in several countries, such as Thailand (Phantharakphong & Pothitha, 2014), Iran (Khodadady & Ghanizadeh, 2011; Naderifar, 2018; Riahi & Pourdana, 2017; Yousofi & Seidi, 2015), Taiwan

(Teo et al., 2016), and China (Liu et al., 2010). In the current study, the participants were Vietnamese university students with identities and experiences that are different from those from other countries. Hence, the findings of this study will assist in understanding EFL students' metacognition and methodological preferences in the Vietnamese context.

7.4 Recommendations

This study found that CCMAL generally had a positive influence on the participating EFL students' metacognition in reading comprehension. Based on its results, the following recommendations are suggested for teachers, researchers and curriculum designers.

For teachers and curriculum designers, it is recommended that concept mapping in general and CCMAL in particular be adopted for fostering students' metacognitive strategies in reading comprehension classes; hence, concept mapping activities should be included in curricula and teaching plans. In the specific context of EFL classes in Vietnam, although many efforts have been made to introduce more student-centred approaches to teaching, most teaching methods remain traditional (Hoang, 2013; Hong et al., 2014). Hong et al. (2014) have suggested that EFL teaching methods that are more positive can actively engage students. CCMAL can be used flexibly in the different learning phases (pre-reading, while-reading and post-reading) to encourage students' use of metacognitive strategies (planning, monitoring and evaluation). Before the reading of the text, it can activate students' background knowledge in ways that stimulate their interest in the text content and facilitate comprehension; students can predict the content of the text by answering focus questions that initiate the map construction process. In the while-reading phase, CCMAL can help students regulate their comprehension process through the use of metacognitive strategies such as thinking aloud and self-questioning, and self-regulated learning strategies such as imagery and help-seeking. In the post-reading phase, it can help individual students evaluate their own progress.

This study found that CCMAL had the largest influence on the monitoring of students' comprehension. Hence, it is recommended that curriculum designers emphasise concept mapping activities in EFL reading classes and that teachers use CCMAL during the while-reading phase to monitor their students' comprehension.

The research results show that students' scores on reading metacognition and reading comprehension were not correlated with their scores on CM1. However, their metacognition and reading comprehension outcomes were correlated with their CM2 and CM3. This implies that concept mapping had a gradual influence on the students' metacognition and reading comprehension. It is recommended therefore that teachers and curriculum designers give the students sufficient time and instruction to develop their concept mapping skills.

With regard to the topics of the reading texts, this study found that familiar reading topics facilitated the students' comprehension. Texts with topics closely related to the students' prior knowledge and experience activated their schemata, thus facilitating their skills in inferencing, word contextualising, and anticipation. Correspondingly, students might find it hard to comprehend reading texts whose topics are strange to them as they do not have prior knowledge to connect and explain the information in them. Therefore, this study highly recommends that reading materials should include texts about students' daily-life topics. However, teachers can strategically select reading topics that not only develop students' reading comprehension skills but might also enrich their background knowledge. This can be done by gradually providing students with new information, for example, by first giving them reading texts with familiar topics and later introducing unfamiliar information. By allowing students to progressively develop their vocabulary and broaden their background knowledge, teachers can facilitate their comprehension of texts containing unfamiliar topics.

For future research related to concept mapping and EFL learning, this study recommends that, in addition to participating students, data be collected from teachers. Because teachers directly interact with the students, they will have clear views on their classroom practices and the application of concept mapping. Collecting data from the teachers via interviews, open-ended questionnaires and teaching logs should contribute to a comprehensive view on the influence of concept mapping in classrooms.

The style of concept map considered in this study has been influenced by the format described by Novak and Canas (2007), who initially introduced concept maps as a hierarchical format that organises concepts from the more general to the more specific, with the more general overarching terms above and the more specific terms below. This has resulted in a focus on the language used in the links and concepts of the maps, but a limited range of other map characteristics. Horn (1998), as cited in Kinchin (2000, p. 254), discussed the "visual language" and described a range of "visual typologies" that can influence interpretation of the material presented within a concept map.

Accordingly, the topical concept is located in the centre of the concept map and the concepts are arranged radially around it. For Kinchin (2000), these typologies communicate meaning differently from each other and the words used in a concept map cannot be evaluated separately from the incorporated images and shapes. Kinchin describes the process of meaning making from the integration of these elements as "semantic fusion". In the context of an EFL classroom, these typologies might have different construction procedures as well as advantages and disadvantages. Future research into EFL teaching and learning could compare the meanings communicated through a range of concept mapping typologies.

In the current study, concept mapping was found to have a positive influence on the participating students' metacognition in EFL reading comprehension classes. Future

researchers might use the findings of this research as a foundation for experimenting with the influence of concept mapping in different school subjects. In the specific context of EFL education in Vietnam, for example, they might investigate the use of concept mapping for activating students before their oral practice in speaking classes or for visually organising their ideas in writing classes.

7.5 Limitations

This research has a number of main limitations. First, the students in the EG and the CG might have interacted during data collection. Because the participants for this study were randomly selected from different classes, it is possible that EG students and CG students were in the same class. While participating in this project, students followed their usual school schedule and would meet each other every day. Through their daily conversations, the CG students could have discovered that they were in the control group, which may have negatively influenced their efforts during the course. To minimise the possibility that students of two groups notice the differences between two groups' treatments, the researcher managed to keep students' group name covered. Students were not told which group they belonged to in case they recognised the differences between the two groups' learning methods.

Second, the researcher did not directly conduct the reading courses; a teacher conducted both the EG and CG reading courses. Although this teacher attended a CCMAL training session, there might be gaps in how the researcher and the teacher perceived CCMAL. CCMAL contains three elements (concept mapping, authentic learning, and technology-based learning), and the lack of sufficient comprehension of any of these elements might lead to an insufficient understanding of the intervention. Nevertheless, the researcher tried to minimise any gaps in the researcher's and the teacher's perceptions of CCMAL through email discussions after the teacher had given official consent to participate in the project and in face-to-face training about

CCMAL before the reading courses began. In this training session, the researcher and the teacher exchanged ideas, resolved any questions about CCMAL, and constructed sample concept maps using Cmap.

Third, this research did not include the teacher's perspective in the data collection. Because the teacher directly conducted the reading courses to both groups of students, her ideas about the reading courses could have provided rich information about the use of CCMAL as a learning tool. Had data been collected from the teacher, the researcher might have been able to present a more comprehensive view of the application CCMAL in the context of reading comprehension classes. However, as already mentioned, the researcher attempted to minimise the gaps in how the researcher and the teacher perceived CCMAL by conducting both face-to-face training and email exchanges. It is recommended that further similar research include the teacher's perspective.

Fourth, the researcher sat in a corner of the classroom to collect the classroom observation data. This prevented her from interfering with the students' "real" behaviours in the classroom and from interacting with them in ways that could influence their learning during the observations. However, maintaining this relative distance from the students limited the researcher's collection of valuable data, such as what the students were saying and how they were interacting. Although the researcher tried to make notes of conversations, she could only hear them if the students spoke loudly or were closer to her. For similar future research situations, it is recommended that, where appropriate, observers consider sitting closer to students and/or using video to capture the conversations and interactions of students.

Fifth, the researcher transcribed and translated the students' interviews and learning journals from Vietnamese into English; therefore, there might have been bias in the wording of these translations. Data sources included 21 learning journals from the EG and 26 from the CG, and

12 individual interviews conducted with EG students. The researcher translated the interviews and learning journals and had a back translation conducted by a professional translator to review the adequacy of the translations. Even so, the translations might have had a hint of the researcher's own wording style. To address this potential bias, the researcher read the translated texts as objectively as possible while analysing the data. She also considered the students' words in their contexts rather than as words only.

Sixth, this convergent mixed method research design includes both quantitative and qualitative component. The first research question ("How does CCMAL influence EFL learners' reading comprehension?") aims to identify the influence of CCMAL on students' reading comprehension and the second one ("How does CCMAL influence EFL learners' metacognition?") aims to examine the influence of CCMAL on students' metacognition. In these two research questions, the quantitative aspect was not explicitly revealed as both these research questions begin with 'How' instead of 'What'. However, the quantitative aspect was not eliminated in these two research questions but embedded in the qualitative data set since these research questions also aim to contextualise and explain in depth the influence of the CCMAL on students' reading comprehension and metacognition which are the quantitative aspect of the research questions. In order to address the possible ambiguity of these research questions, the introduction section of chapter 4 and chapter 5 clearly explain the data set involved in each research question.

In addition, this research focused on the significance between EG students' reading comprehension and CG students' reading comprehension yet overlooked the size effect of concept mapping on students' metacognition as well as reading achievements. To some extent, effect size is important to establish a comprehensive understanding of the full impact of the treatment as it helped to explain the magnitude of the significances found. This might be a recommendation for further research into the influence of concept mapping on students'

reading comprehension to obtain a more comprehensive understanding of how concept mapping influenced students' metacognition and reading comprehension.

7.6 The researcher's reflections

Teaching has always been my passion. I find personal fulfilment in being able to help others through education. To pursue my ambitions to become a teacher, I completed a bachelor's degree and a master's course in TESOL at the prestigious Vinh University, Vietnam. During my years of formal study there, I learned various teaching methodologies that have helped my teaching practice.

When I was offered my first teaching role at a local university in central Vietnam, I put into practice the teaching methods I had learned, but I found that some of them failed to capture students' interest, which was reflected in their learning difficulties. I raised these concerns with Dr. Trinh, an esteemed colleague at Eastern Star University, and she advised me to explore the teaching methodologies adopted by countries with advanced education systems. While researching this possibility, came across a scholarship for an Australian doctoral program. The Australian education system is globally recognised as of the highest standards. I saw this scholarship as an ideal opportunity to learn new methods that I could incorporate in my teaching and introduce in Vietnam, ultimately helping students there to improve how they study.

In 2017, the friendly staff of Western Sydney University helped me enroll into a PhD in education. Since then, I have gained an enormous amount of theoretical and practical knowledge from my academic supervisors, peers, and other mentors. In this atmosphere of collaboration, they acknowledged my ideas and questions and greatly contributed to my development as a professional. I will always be forever grateful for the sense of community I experienced.

The most salient challenge I met while working on my PhD was choosing the topic of my study. Although my vision for the project was quite clear – improving Vietnamese students' English learning – selecting the research approach was complicated. I changed my topic a few times, along with adapting the research perspective and theoretical framework. A review of the existing literature and advice from my supervisors helped me determine the key areas for further research in the field of English learning and teaching in Vietnam.

Taking off from that point, the data collection process ran smoothly. I was able to tap the assistance of teachers, administrators and a few students at the site university in Vietnam, and within a week we gathered 100 consent forms. The Dean of the School of Economics at the university was gracious, giving us access to a laboratory room for the reading courses and to the lecture schedules. While observing the reading classes, I saw how the participating students reacted to the Cmap concept mapping software with increased focus and concentration and with long and intense group discussions. This allowed me to conclude that the use of the concept mapping software can facilitate student engagement in EFL classes.

The study was conducted in the contemporary EFL context in Vietnam. Hence, it was crucial that my doctoral supervision panel be culturally sensitive and aware of the research implications. My supervisors' vast knowledge of education in Asian countries has provided me with many relevant insights during the course of my research.

I am proud that I was able to complete my study despite some personal struggles. It was incredibly challenging to balance my academic pursuit with the demands of motherhood. Deciding to come to Australia meant that I had to leave my children back home in Vietnam. However, I have always considered them my strength and inspiration. I was able to get through the tough times because of those little moments during the day where I would see and talk to them online and on the phone. Despite the distance, I made sure to monitor how they were

doing in school. I remember how proud I was when my elder son garnered a high distinction academic award at school and that precious moment my younger son called me "mẹ" which means mum in Vietnamese for the first time. I feel so blessed to have my family's support and understanding throughout this journey.

The COVID pandemic also brought about unanticipated difficulties in scheduling and communication. With the lockdowns and uncertainties about how the pandemic would unfold, discussions with my supervisors had to be conducted online and scheduling was almost impossible to arrange. This caused additional stress and anxiety, but I remained resilient and focused on my goal.

I believe the completion of my thesis is only the start of a more exciting journey. I hope to contribute to a post-pandemic "new normal" in Vietnam by introducing innovative teaching methodologies and materials to the university where I work. Meanwhile, I want to spend time with my children and hug them while I still can. One lesson this pandemic taught me is the importance of doing things that really matter for others and, most importantly, yourself.

References

Afflerbach, P., Pearson, P. D., & Paris, S. G. (2008). Clarifying Differences Between Reading Skills and Reading Strategies. *The Reading Teacher*, *61*(5), 10.

Ahmadi, M., Ismail, H., & Abdullah, M. (2013). 'The Importance of Metacognitive Reading Strategy Awareness in Reading Comprehension. *School of Educational Studies*. https://doi.org/http://dx.doi.org/10.5539/elt.v6n10p235

Akbayrak, B. (2000). A comparison of two data collection methods: interviews and questionnaires. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *18*(1), 10.

Akturk, A. O., & Sahin, I. (2011). Literature Review on Metacognition and its Measurement. *Procedia - Social and Behavioral Sciences*, *15*, 7.

Al-Issa, A. (2006). Schema Theory And L2 Reading Comprehension: Implications For Teaching. *Journal of College Teaching & Learning*, *3*(7), 9.

Al-Shumaimeri, Y. A. N. (2006). The Effects of Content Familiarity and Language Ability on Reading Comprehension Performance of Low and High-ability Saudi Tertiary Students Studying English as a Foreign Language. *Edu. Sci. & Islamic Stud*, *18*(2), 19.

Alajmi, S. S. S. (2011). *Factors Influencing Information and Communication Technology Implementation in Government Secondary Schools in Kuwait* University of Exeter].

Alansari, W. M. (2010). *Use of Concept Maps to Improve Saudi Pre-Service Teachers' Knowledge and Perception of Teaching Social Studies* Curtin University].

Alfaki, I. M., & Siddiek, A. G. (2013). The Role of Background Knowledge in Enhancing Reading Comprehension. *World Journal of English Language*, *3*(4), 25.

Allen, M. (2017). Field Notes. In M. Allen (Ed.), *The SAGE Encyclopedia of Communication Research Methods*. Sage.

Ammigan, R., Dennis, J. L., & Jones, E. (2021). The Differential Impact of Learning Experiences on International Student Satisfaction and Institutional Recommendation. *Journal of International Students*, *11*(2), 22.

Amzil, A., & Stine-Morrow, E. A. L. (2013). Metacognition: Components and Relation to Academic Achievement in College. *Arab World of English Journal*, *4*(4), 15.

An, S. (2013). Schema Theory in Reading. *Theory and Practice in Language Studies*, *3*(1).

Anderson, N. (2001). *The Role of Metacognition in Second Language Teaching and Learning* eric@cal.org

Anh, K. H. K. (2010). Use of Vietnamese in English Language Teaching in Vietnam: Attitudes of Vietnamese University Teachers. *English Language Teaching*, *3*(2), 9.

Anohina-Naumecca, A. (2013). Finding factors influencing students' preferences to concept mapping tasks: literature review. *Procedia - Social and Behavioral Sciences*, *128*, 6.

Aritonang, I. R., Lasmana, S., & Kurnia, D. (2018). The Analysis of Skimming and Scanning Technique to Improve Students in Teaching Reading Comprehension. *Professional Journal of English Education*, *1*(2), 6.

Asiksoy, G. (2019). Computer-based Concept MApping as a Method for Enhancing the Effectiveness of Concept Learning in Technology. *Sustainability*, *11*, 19.

Asmari, A. A., & Javid, C. Z. (2018). Role of Content Schema in Reading Comprehension Among Saudi EFL Students: EFL Teachers' Perspective and Use of Appropriate Classroom Strategies. *International Journal of English Linguistics*, *8*(4), 10.

Atoum, A. y., & Reziq, A. M. (2018). Current Research Journal of Social Sciences and Humanities. *Can Mental Imagery Predicts Reading Comprehension?*, *1*(1), 8.

Auerbach, A. J. J., Higgins, M., Brickman, P., & Andrews, T. C. (2018). Teacher Knowledge for Active-Learning Instruction: Expert–Novice Comparison Reveals Differences. *CBE life sciences education*, *17*(1).

Ausubel, D. (2000). Assimilation Theory in Meaningful Learning and Retention Processes. In *The Acquisition and Retention of Knowledge: A Cognitive View* (pp. 15). Springer-Science Business Media Dordrecht.

Ausubel, D., Novak, J., & Hanesian, H. (1978). *Educational psychology: a cognitive view* (2nd ed.). Holt, Rinehart & Winston.

Azevedo, R., & Aleven, V. (2013). Metacognition and Learning Technologies: An Overview of Current Interdisciplinary Research. In R. Azevedo & V. Aleven (Eds.), *International Handbook of Metacognition and Learning Technologies, Springer International Hanbooks of Education*. Springer Science+Business.

Azizifar, A., Roshani, S., Gowhary, H., & Jamalinesari, A. (2014). The Effect of Pre-reading Activities on the Reading Comprehension Performance of Ilami High School Students. 2nd Global COnference on Linguistics and Foreign Language Teaching, LINELT, United Arab Emirates.

Bada, S. O. (2015). Constructivism Learning Theory: A Paradigm for Teaching and Learning. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, *5*(6), 5.

Badrinathan, V. (2015). Self-assessment and Learner Autonomy: Challenges in Foreign Language Teaching in India. Third 21st CAF Conference at Harvard, Boston, USA.

Bailey, J., & Rutledge, B. (2017). The Educational Psychology of Clinical Training. *Am J Med Sci.*, *353*(2), 5.

Baker, L. (2008). Metacognition in Comprehension Instruction. In C. C. Block & M. Pressley (Eds.), *Comprehension Instruction: Research-based test Practices*. The Guilford press.

Baker, S. E., & Edwards, R. (2012). *How many qualitative interviews are enoguh?* NCRM - National Center for Reasearch Methods. http://www.ncrm.ac.uk/TandE/video/podcas...

Barron, B., & Roschelle, J. (2009). Shared Cognition. In E. Anderman (Ed.), *Psychology of Classroom Learning: An Encyclopedia*. Macmillan Reference USA.

Barsalou, L., Yeh, W., Luka, B. J., & Olseth, K. L. (1999). Concepts and Meaning. *Behavioral and Brain Sciences*, *22*, 32.

Basaraba, D., Yovanoff, P., Alonzo, J., & Tinda, G. (2013). Examining the structure of reading comprehension: do literal, inferential, and evaluative comprehension truly exist? *Reading and Writing*, *26*(3), 30.

Bautista, I. (2016). Generic competences acquisition through classroom activities in first-year agricultural engineering students. *International Journal of Educational Technology in Higher Education*, *13*(29).

Betoret, F. D., Abellán-Roselló, L., & Gómez-Artiga, A. (2017). Self-Efficacy, Satisfaction, and Academic Achievement: The Mediator Role of Students' Expectancy-Value Beliefs. *Frontiers in Psychology*, *8*.

Beydarani, V. (2015). The Influence of Concept Mapping on Reading Comprehension of Iranian English Students Employing Persuasive and Descriptive Texts. *Journal of Language Teaching and Research*, *6*(1), 8.

Birt, L., Scott, S., & Cavers, D. (2016). Member Checking: A Tool to Enhance Trustworthiness or Merely a Nod to Validation? *PubMed*. https://doi.org/https://doi.org/10.1177/1049732316654870

Blaikie, N. (2007). *Designing Social Research* (2nd ed.). Polity.

Bock, G. (2000). Difficulties in Implementing Communicative Theory in Vietnam. *Teacher's Edition*.

Bovill, C., C.J, B., & Morss, K. (2011). Engaging and empowering first-year students through curriculum design: perspectives from the literature. *Teaching in Higher Education*, *16*(2), 12.

Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic Analysis and Code Development*. Sage.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2).

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology* (Vol. Vol. 2: Research designs: Quantitative, qualitative, neuropsychological, and biological). American Psychological Association.

Braun, V., & Clarke, V. (2013). *Thematic Analysis - A Reflexive approach* https://www.psych.auckland.ac.nz/en/about/thematic-analysis.html

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Contemporary Views and Provocations*, 8.

Broek, P. v. d., Kendeou, P., Kremer, K., Lynch, J., Butler, J., White, M. J., & Lorch, E. P. (2005). Assessment of Comprehension Abilities in Young Children In S. Stahl & S. Paris (Eds.), *Children's Reading Comprehension and Assessment* (pp. 24). Erlbaum.

Bruillard, E., & Baron, G.-L. (2000). Computer-Based Concept Mapping a Cognitive Tool for Students: A review. Conference on educational uses of information and communication technologies, Beijing, China.

Calvo, R. A., & Markauskaite, L. (2010). Factors Affecting Students' Experiences and Satisfaction about Teaching Quality in Engineering. *Australasian Journal of Engineering Education*, *16*(2).

Campbell, L., & Campbell, B. (2009). Beginning With What Students Know: The Role of Prior Knowledge in Learning. In *Mindful Learning: 101 Proven Strategies for Student and Teacher Success*. Corwin Press.

Canale, M., & Swain, M. (1980). Theoretical Bases of Communicative Approaches to Second Language Teaching and Testing. *Applied Linguistics Review*, *1*(1), 47.

Canas, A. J., Coffey, J. W., Carnot, M. J., Feltovich, P., Hoffman, R. R., Feltovich, J., & Novak, J. D. (2003). *A Summary of Literature Pertaining to the Use of Concept Mapping Techniques and Technologies for Education and Performance Support*. The Institute for Human and Machine Cognition

Canas, A. J., Hill, G., Carff, R., Suri, C., Lott, J., Gomez, G., Eskridge, T. C., Arroyo, M., & Carvajal, R. (2004). Cmap Tools: A Knowledge Modeling and Sharing Environment. International Conference on Concept Mapping, Pamplona, Spain.

Canh, L. V. (2001). Language and Vietnamese Pedagogical Contexts. *Teacher's Edition*, 4.

Canh, L. V. (2007). A historical review of English language education in Vietnam. In Y. H. Choi & B. Spolsky (Eds.), *English education in Asia: History and policies* (pp. 14). Asia TEFL.

Canh, L. V., & Barnard, R. (2009). Curricular innovation behind closed classroom doors: A Vietnamese case study. *Prospect*, *24*(2), 14.

Cannella, G., & Lincoln, Y. S. (2011). Ethics, Research Regulations, and Critical Social Science. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE Handbook of Qualitative Research*. Sage

Carcary, M. (2009). The Research Audit Trial – Enhancing Trustworthiness in Qualitative Inquiry. *The Electronic Journal of Business Research Methods*, *7*(1), 13.

Carrell, P. L., & Eisterhold, J. C. (1983). Schema Theory and ESL Reading Pedagogy. *TESOL Quarterly*, *17*(4), 21.

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. J. (2014). The use of triangulation in qualitative research. *Oncol Nurs Forum*, *41*(5), 3.

Cassata, A. E., & French, L. (2006). Using Concept Mapping to Facilitate Metacognitive Control on Preschool Children. *Concept Maps: Theory, Methodology, Technology*, 8.

Chalapatia, S., Leunga, R., & Chalapati, N. (2018). Exploring factors affecting first-year students' learning experiences: A case study of a private university in Taiwan. *Student Success*, *9*(4), 14.

Chang, K.-e., Sung, Y.-T., & Chen, I.-D. (2002). The Effect of Concept Mapping to Enhance Text Comprehension and Summarization. *The Journal of Experimental Education*, *71*(1), 5.

Chang, K. E., Sung, Y. T., & Chen, S. F. (2001). Learning through computer-based concept mapping with scaffolding aid. *Journal of Computer Assisted Learning*, *17*, 13.

Channa, M. A., Abassi, A. M., John, S., Mohammad, J. K., Memon, M. A., & Nordin, Z. S. (2018). Reading Comprehension and Metacognitive Strategies in First Year Engineering University Students in Pakistan. *International Journal of English Linguistics*, *8*(6), 10.

Channa, M. A., Nordin, Z. S., Siming, I. A., Chandio, A. A., & Koondher, M. A. (2015). Developing Reading Comprehension through Metacognitive Strategies: A Review of Previous Studies. *English Language Teaching*, *8*(8), 6.

Charmaz, K. (2006). *Constructing Grounded Theory A Practical Guide Through Qualitative Analysis* Sage.

Charzyńska, E. (2015). Text topic interest, willingness to read and the level of reading comprehension among adults – The role of gender and education level. *The New Educational Review*, *39*(1), 12.

Cheng, J., & Koszalka, T. A. (2016). Cognitive Flexibility Theory and its Application to Learning Resources. *RIDLR project*.

Chevron, M.-P. (2014). A metacognitive tool: Theoretical and operational analysis of skills exercised in structured concept maps. *ScienceDirect*, *2*, 9.

Chi, N. H., & Vy, P. T. (2021). The Relationships between Metacognition and Reading Strategies: The Case of English-Majored Students at a Private University in Vietnam. *European Journal of Educational Research*, *10*(3), 18.

Chung, H. V. (2012). *A Study of Reading Comprehension Problems in English Encountered by First Year Students of Faculty of Vietnamese Studies at HNUE*. HNUE. http://foe.hnue.edu.vn/Portals/1/Ho%20Chung.pdf

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Routledge.

Cooper, S. L. (2018). *Self-generated questions and concept mapping to improve information in the long-term* Middle Tennessee State University].

Creswell, J. (2015). *A concise introduction to mixed methods research*. Sage.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Sage.

Creswell, J. W., & Clark, V. L. (2010). *Designing and conducting mixed methods research* (2nd ed.). Sage.

Creswell, J. W., & Miller, D. L. (2010). Determining Validity in Qualitative Inquiry. *Theory into Practice*, *39*(3), 7.

Cumming, J., & Williams, S. E. (2012). The Role of Imagery in Performance. In S. Murphy (Ed.), *Handbook of Sport and Performance Psychology*. Oxford University Press.

Dansereau, D. (2004). Node-link Mapping Principles for Visualising Knowledge and Information. Knowledge and Information Visualisation, Tubingen, Germany.

Davoudi, M., & Moghadam, H. R. H. (2015). Critical Review of the Models of Reading Comprehension with a Focus on Situation Models. *International Journal of Linguistics*, *7*(5), 16.

Defrioka, A. (2013). Anticipation Guide: A Strategic of Teaching Reading Comprehension. SELT 2013 Proceeding,

Demir, S. B., & Pismek, N. (2017). A Convergent Parallel Mixed-Methods Study of Controversial Issues in Social Studies Classes: A Clash of Ideologies. *Educational Sciences: Theory & Practice*, *18*, 30.

Derbentseva, N., Safayeni, F., & Canas, A. J. (2008). How to teach dynamic thinking with concept maps. In G. F. Ollington (Ed.), *Teachers and Teaching Strategies*. Nova Science Publishers.

Dickinson, E. R., Adelson, J., & Owen, J. (2012). Gender balance, representativeness, and statistical power in sexual research using undergraduate student samples. *Archives of Sexual Behavior*, *42*(1), 3.

Djanettea, B., & Fouad, C. (2014). Determination of university students' misconceptions about light using concept maps. *Procedia - Social and Behavioral Sciences*, *152*, 17.

Dorkchandra, D. (2010). *Enhancing English Reading Comprehension Through a Text Structure Reading Strategy CALL Program* Suranaree University of Technology].

Drost, E. A. (2011). Validity and Reliability in Social Science Research. *Education Research and Perspectives*, *38*(1), 19.

Duc, N. D. (2009). *A Study of the Implementation of a Problem-Based Learning Approach in University Classes in Vietnam* RMIT University].

Eidswick, J. (2009). *The influence of interest on reading comprehension in EFL students* (Annual Research Report of the Language Center, Issue.

El-Koumy, A. S. A. K. (2004). *Metacognition and Reading Comprehension: Current Trends in Theory and Research*. Anglo Egyptian Bookshop.

Elliott, S. N., Kratochwill, T. R., Littlefield Cook, J., & Travers, J. (2000). *Educational psychology: Effective teaching, effective learning* (3rd ed.). McGraw-Hill College.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 4.

Fageeh, A. I. (2018). Effects of Computerised Concept Mapping on Developing Reading Comprehension in an Advanced College Reading Course. Eighth International Conference on Concept mApping, Medellin, Colombia.

Farrokhnia, M., Díaz, H. J. P., Noroozi, O., & Hatami, J. (2019). Computer-supported collaborative concept mapping: The effects of different instructional designs on conceptual understanding and knowledge co-construction. *Computers & Education*, *14*, 15.

Felipe, A. L., Amouroux, E., Pham, T., & Stojcevski, A. (2016). Vietnamese Students Awareness towards a Project Based Learning Environment. PAEE/ALE 2016 - 8th International Symposium on Project Approaches in Engineering Education / 14th Active Learning in Engineering Education Workshop, Guimaraes, Portugal.

Ferguson, K. (2018). How and When to Collect Observational Data. *Humans of Data*.

Fisher, D., Frey, N., & Lapp, D. (2011). Coaching middle-level teachers to think aloud improves comprehension instruction and student reading achievement. *The Teacher Educator*, *46*(3), 13.

Flavell, J. H. (1979). Metacognition and Cognitive Monitoring: A New Area of Cognitive-Developmental Inquiry. *American Psychologists*, *34*(10), 6.

Foncha, J. W. (2014). Reading as a Method of Language Learning among L2/First Additional Language Learners: The Case of English in one High School in Alice. *Mediterranean Journal of Social Sciences*, *5*(27), 17.

Fox, N. (2008). Post-positivism. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods*. Sage.

Frarjami, H. (2020). Misconception Analysis: A Necessary Complement to Foreign Language Teaching. *English Teaching Forum Online – Bureau of Educational and Cultural Affairs*.

Fu, B. (2016). Interactive Reading Model and College English Reading. 3rd International Conference on Education, Management, Arts, Economics and Social Science,

Gardner, D. (2000). Self-assessment for autonomous language learners. *Links and Letters*, 7, 12.

Gaskell, G. (2000). Individual and Group Interviewing. In M. W. Bauer & G. Gaskell (Eds.), *Qualitative Researching with Text, Image and Sound*. Sage.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Allyn& Bacon.

Ghebranejad, F., Khodabandehlou, M., & Jahandar, S. (2013). The Effect pf Word Contextualisation on Iranian Intermediate EFL learners' Reading Comprehension Ability. *Indian Journal of Fundamental and Applied Life Sciences*, *3*(1), 7.

Gomez, A., & Sanjosez, V. (2012). Effectiveness of comprehension monitoring strategies in EFL non-bilingual Spanish university students reading science texts. *Revista Espanola de Linguistica Aplicada*, *11*, 14.

González, J. D. G. (2017). A Model for the Strategic Use of Metacognitive Reading Comprehension Strategies. profile Issues in Teachers' Professional Development, Bogota, Colombia.

Gorsuch, G., & Taguchi, E. (2010). Developing Reading Fluency and Comprehension Using Repeated Reading: Eividence from Longitudial Students Reports. *ERIC*, *14*(1), 33.

Grabe, W. (2009). Key Issues in L2 Reading Development. CELC Symposium,

Grant, R., & Sugarman, J. (2005). Ethics in Human Subjects Research: Do Incentives Matter? *Journal of Medicine and Philosophy*, *29*(6), 22.

Grix, J. (2004). *The Foundation of Research*. Palgrave Macmillan.

Gruber, H. (2001). Expertise, Acquisition of. In N. J. Smelser & P. B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences*. Elseviers.

Guest, G., Bunce, A., & Johnson, L. (2006). How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field Methods*, *18*(1), 24.

Ha, H. T. L., Lan, N. T. P., Van, N. P. T., & Phuong, L. T. H. (2019). An Investigation into the Use of Reading Comprehension Strategies used by non English Majors at University of Foreign Languages, Hue University. *Journal of Inquiry into Languages and Cultures*, *3*(3).

Hanafi, H. F., Said, C. S., Ariffin, A. H., & Zainuddin, N. A. (2016). Using a collaborative Mobile Augmented Reality learning application (CoMARLA) to improve Improve Student Learning. *IOP Conference Series Materials Science and Engineering*, *160*(1), 9.

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative research. *Evidence-Based Nursing*, *18*(3), 3.

Hellekjær, G. O. (2007). Reading: From a Forgotten to a Basic Skill. *Språk & språkundervising*, *2*(6).

Hien, T. T. T., & Phuong, T. T. (2018). Using reading comprehension strategies to Enhance EFL Reading Comprehension Skills for Students at Institute of Argriculture - Vietnam. *Journal of Education*, *428*(2), 5.

Hieu, D. M., & Huong, P. L. T. (2021). Metacognitive Awareness of Reading Strategies on Second Language Vietnamese Undergraduates. *Arab World English Journal*, *12*(1), 22.

Ho, W. (2012). *The Effect of Concept Mapping on Learner's Metacognitive Skills in Problem Solving* http://personal.psu.edu/wxh139/documents/final_545.PDF

Hoang, N. T. B. (2013). *English Learning Strategies of Vietnamese Tetiary Students* University of Tasmania].

Hoffman, J., Bianchi, R., & Durani, M. (2021). Education theory made practice: Ausubel's meaningful learning theory. *Education Theory*, *5*.

Hong, N. T., Warren, W., & Fehring, H. (2014). Factors Affecting English Language Teaching and Learning in Higher Education. *English Language Teaching*, *7*(8), 12.

Hora, M. T., & Ferrare, J. J. (2013). A Review of Classroom Observation Techniques in Postsecondary Settings *WCER Working Paper*, *1*.

Huan, N. B., & Quan, P. N. (2018). Concept Mapping Influencing Students' Ability to Summarize Reading Passages. *European Journal of Education Studies*, *4*(4), 14.

Huang, Y.-C. (2021). Comparison and Contrast of Piaget and Vygotsky's Theories. *Advances in Social Sciences, Education and Humanities Research*, *554*.

Hung, D. M., & Thao, N. T. P. (2014). Vietnamese EFL Learners' Reading Comprehension Affected via Metacognitive Strategy Instruction. *International Journal for Research in Education*, *3*(5), 14.

Ibrakhimovna, K. G. (2016). Benefits of Implementation of Pre-, While and Post reading activities in language learning. *Международный научный журнал*, *4*.

Inamdar, R., & Rathod, R. (2012). Learning Experiences in School Based Subject. *Cholarly Research Journal for Interdisciplinary Studies*.

Ishai, A., & Sagi, D. (1997). Visual Imagery: Effects of Short- and Long-Term Memory. *Journal of Cognitive Neuroscience*, *9*(6), 13.

Islam, S., & Santoso, E. (2018). The Effectiveness of Using Authentic Texts in the Teaching Reading Comprehension. *English Teaching Learning and Research Journal*, *4*(2), 15.

Jonassen, D. (2009). Reconciling a human cognitive architecture. In S. T. T. M. Duffy (Ed.), *Constructivist instruction: Success or failure?* Routledge/Taylor & Francis Group.

Joseph, L. M., Alber-Morgan, S., Cullen, J., & Rouse, C. (2016). The Effects of Self-Questioning on Reading Comprehension: A Literature Review. *Reading & Writing Quarterly*, *32*(2).

Kabir, S. M. S. (2016). Methods of Data Collection. In *Basic Guidelines for Research: An Introductory Approach for All Disciplines*. Book Zone Publication.

Kalanzadeh, G.-A., Malekin, Z., & Raz, A. (2014). Concept Maps and Reading Comprehension among EFL Learners. *International Journal of Inovation and Research in Educational Sciences*, *1*(2), 7.

Kalhor, M., & Mehran, G. (2016). The Effect of Concept Mapping on EFL Students' Meaningful Learning of English Reading Comprehension. 7th Conference on Concept Mapping, Tallin, Estonia.

Kalhor, M., & Shakibaei, G. (2012). Teaching reading comprehension through concept map. *Life Science Journal*, *9*(4), 7.

Kamble, S., & Tembe, B. L. (2013). The Effect of Use of Concept Maps on Problem Solving Performance and Attitude in Mechanical Engineering Course. *Procedia - Social and Behavioral Sciences*, *83*, 7.

Karabenick, S. A., & Berger, J.-L. (2013). Help seeking as a self-regulated learning strategy. In H. Bembenutly, T. J. Cleary, & A. Kitraulai (Eds.), *Application of Self-Regulated Learning Across Diverse Disciplines*. IAP.

Karbalaei, A. (2011). Metacognition and Reading Comprehension. *Ikala Revisita de language y cultura*, *16*(28), 14.

Karpicke, J. D. (2017). *Retrieval-Based Learning: A Decade of Progress*. Elsevier.

Karpicke, J. D., Blunt, J. R., Smith, M. A., & Karpicke, S. S. (2014). Retrieval-based learning: The need for guided retrieval in elementary school children. *Journal of Applied Research in Memory and Cognition*, *3*, 9.

Karpicke, J. D., & Grimaldi, P. J. (2012). Retrieval-Based Learning: A Perspective for Enhancing Meaningful Learning. *Educ Psychol Rev*, *24*, 18.

Kawulich, B. B. (2005). Participant Observation as a Data Collection Method. *Forum Quantitative Social Research*, *6*(2), 43.

Kendeou, P., Broek, P. v. d., Helder, A., & Karlsso, J. (2014). A Cognitive View of Reading Comprehension: Implications for Reading Difficulties. *Learning Disabilities Research and Practice*, *29*(1), 7.

Kendeou, P., McMaster, K. L., & Christ, T. (2016). Reading Comprehension: Core Components and Processes. *Policy Insights from the Behavioral and Brain Sciences*, *3*(1).

Kendeou, P., Papadopoulos, T. C., & Spanoudis, G. (2012). Processing demands of reading comprehension tests in young readers. *Learning and Instruction*, 14.

Khaghaninejad, M. S., & Arefinejad, M. (2015). How do Concept-Maps Function for Reading Comprehension Improvement of Iranian Advanced EFL Learners of Both Genders? *English Language Teaching*, *8*(7), 7.

Khine, A., Adefuye, A. O., & Busari, J. O. (2019). Utility of concept mapping as a tool to enhance metacognitive teaching and learning of complex concepts in undergraduate medical education. *Archivers of Medicine and Health Sciences*, *7*(2), 6.

Khodadady, E., & Ghanizadeh, A. (2011). The Impact of Concept Mapping on EFL Learners' Critical Thinking Ability. *English Language Teaching*, *4*(4), 12.

Khoi, M. N. (2014). Towards a Holistic Approach to Developing the Language Proficiency of Vietnamese Primary Teachers of English. *Electronic Journal of Foreign Language Teaching*, *11*(2), 16.

Khoshsima, H., & Saed, A. (2015). Concept Mapping Strategy and EFL Learners' Vocabulary Acquisition and Retention. *International Journal of Humanities and Cultural Studies 2*(1), 18.

Kien, L. T., & Huan, N. B. (2017). Teaching Beliefs about Critical Reading Strategies in English as a Foreign Language Classes in Mekong Delta Institutions, Vietnam. *European Journal of English Language Teaching*, *2*(4).

Kinchin, I. M. (2000). *The active use of concept mapping to promote meaningful learning in biological science.* University of Surrey].

Kinchin, I. M., Möllits, A., & Reiska, P. (2019). Uncovering Types of Knowledge in Concept Maps. *Education Sciences*, *9*(131), 14.

Kington, A., Sammons, P., Brown, E., & Regan, E. (2018). *Effective Classroom Practice: a mixed methods study of influences and outcomes*. Open University Press.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, *41*(2).

Kok, I., & Canbay, M. O. (2011). An experimental study on the vocabulary level and vocabulary consolidation strategies. *Procedia - Social and Behavioral Sciences*, *15*, 4.

Kraayenoord, C. E. v. (2010). The role of metacognition in reading comprehension. *J. Pendidik. Bhs*, *6*, 30.

Kucan, L., & Beck, I. (1997). Thinking Aloud and Reading Comprehension Research: Inquiry, Instruction, and Social Interaction. *Review of Educational Research*, *67*(3), 29.

Kuhn, D., & Dean, D. (2004). Metacognition: A Bridge Between Cognitive Psychology and Educational Practice. *Theory into Practice*, *43*(4), 25.

Lai, E. R. (2011). Metacognition: A literature Review. *Pearson Assessments Research Reports*.

Lan, N. T. T. (2019). *Using IC Using ICT to foster collabor o foster collaborative writing for EFL univ e writing for EFL university students in Vietnam* Edith Cowan University].

Latham-Koenig, Oxenden, C., & Seligson, P. (2012). *English File* (3rd ed.). Oxford University Press.

Latham, J. (2014). *Qualitative sample size: How many participants is enough?* http://johnlatham.me/many-participants-enough/

Lawton, J., Saunders, R., & Muhs, P. (1980). Theories of Piaget, Bruner, and Ausubel: Explications and Implications, . *The Journal of Genetic Psychology*, *136*(1), 15.

Lechuga, M. T., Ortega-Tudela, J. M., & Gomez-Ariza, C. J. (2015). Further evidence that concept mapping is not better than repeated retrieval as a tool for learning from texts. *Learning and Instruction*, *40*, 7.

Lee, C. B. (2014). Technologies for Literacy: Using Technologies in a Problem Solving Environment. *Australian Educational Computing*, *29*(2).

Lee, C. B., Hanham, J., Kannangara, K., & Qi, J. (2021). Exploring user experience of digital pen and tablet technology for learning chemistry: applying an activity theory lens. *Heliyon*, *7*.

Lindorff, A., & Sammons, P. (2018). Going beyond structured observations: looking at classroom practice through a mixed method lens. *ZDM*, *50*, 13.

Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. *Qualitative Research Journal*, 27. https://doi.org/10.1108/QRJ-12-2018-0012

Liu, C., & Long, F. (2014). The Discussion of Traditional Teaching and Multimedia Teaching Approach in College English Teaching. International Conference on Management, Education and Social Science,

Liu, P.-L., Chen, C.-J., & Chang, Y.-J. (2010). Effects of a computer-assisted concept mapping learning strategy on EFL college students' English reading comprehension. *Computers & Education*, *54*, 10.

Loi, N. V., & Hang, C. T. (2014). Các yếu tố ảnh hưởng năng lực Tiếng Anh của sinh viên sư phạm Tiếng Anh. *Journal of Science - Can Tho University*, *32*(8).

Lombardi, M. M. (2007). Authentic Learning for 21st Century: An Overview. *Educause Learning Initiative*, 12.

Long, N. V. (2016). Applying ICT in EFL teaching: From internation experiences to Vietnamese situation. *Journal of Science - Hanoi National University*, *32*(2), 12.

Lynch, M. (2021). Reading process: The Bottom-up Theory. (https://www.theedadvocate.org/reading-process-the-bottom-up-theory)

Mai, H. T. N. (2017). Contextual Factors Affecting the Implementation of Communicative Language Teaching in Vietnam. *EFL Journal*, *2*(2), 12.

Mammen, J. R. (2016). Computer-assisted concept mapping: Visual aids for knowledge construction. *J Nurs Educ*, *55*(7), 4.

Marinaccio, J. (2012). The Most Effective Pre-reading Strategies for Comprehension. *Education Masters*.

Marriott, R. d. C. V., & Torres, P. L. (2016). Concept maps and Language Acquisition: An Implication with English Language Level 2 Students. Seventh Int. Conference on Concept Mapping, Tallinn, Estonia.

Martinez, M. E. (2006). What is Metacognition? *Phil Delta Kappan Magazine*.

Maxwell, J. A., & Mittapalli, K. (2010). Realism as a Stance for Mixed Methods Research. In A. Tashakkori & C. Teddlie (Eds.), *SAGE Handbook of Mixed Methods in Social and Behavioral Research*. Sage.

Mayer, R. E. (2002). Rote Versus Meaningful Learning. *Theory into Practice*, *41*(4), 8.

McDonald, S. (2001). *Experiences and Pictures: Using Visual Iamagery and Background Knowledge to Improve Reading Comprehension* University of Lethbridge].

McLeod, S. (2020). Piaget's Stages of Cognitive Development Background and Key Concepts of Piaget. *Simply Psychology*.

McVee, M. B., Dunsmore, K., & Gavelek, J. R. (2005). Schema Theory Revisited. *Review of Educational Research*, *75*(4), 36.

Mero-Jaffe, I. (2011). 'Is that what I Said?' Interview Transcript Approval by Participants: An Aspect of Ethics in Qualitative Research. *The International Journal of Qualitative Method*, *10*(3).

Minh, N. T. N. (2016). *The Cultural Appropriateness of Communicative Language Teaching: A Case Study of the EFL Program Implementation at a Vietnamese Tertiary Institution* Western Sydney University].

Minh, N. T. N., & Nga, N. T. (2019). An investigation into reading strategies used by Vietnamese non-English major students at Kien Giang University. *Ho Chi Minh City Open University Journal of Science*, *9*(2), 7.

Mirhadizadeh, N. (2016). Internal and External Factors in Language Learning. *International Journal of Modern Language Teaching and Learning*, *1*(5), 8.

Project "Teaching and Learning Foreign Languages In Vietnamese education system 2008-2020", (2008).

The 6-level National Foreing Language Framework for Vietnam, (2014).

Circular 32/2018/TT-BGDĐT, (2018).

Mohajan, H. K. (2017). Two Criteria for Good Measurements in Research: Validity and Reliability. *Annals of Spiru Haret University Economic Series*, *17*(4), 23.

Moru, E. K. (2007). Talking with the Literature on Epistemological Obstacles. For the Learning of Methematics, Edmonton, Alberta, Canada.

Myers, B., Hudson, S. E., & Pausch, R. (2000). Past, Present, and Future of User Interface Tools. *ACM Transactions on Computer-Human Interaction*, *7*(1), 25.

Naderifar, A. (2018). The comparative effect of concept mapping and vocabulary notebook keeping on Iranian EFL learners' self-regulation in vocabulary learning. *Cogent Education*, *5*, 16.

Newcomer, K. E., Hatry, H. P., & Wholey, J. S. (2015). Conducting semi-structured interviews. *Handbook of practical program evaluation*, *492*.

Ngoc, D., Toan, P., Min, P., & Kham, T. (2018). English as an international language in Viet Nam: history and development. *Englishes*, *20*(2), 15.

Nhon, D. T. (2011). *Exploring CALL Options for Teaching EFL in Vietnam* Minessota State Univesity].

Nhu, P. T. T., Keong, T. C., & Wah, L. K. (2018). Exploring Teaching Engilsih Using ICT in Vietnam: The Lens of Activity Theory. *International Journal of Modern Trends in Social Sciences*, *1*(3), 14.

Noor, N. H. M. (2016). *Second Language Reading Comprehension Strategies in Brunei Darussalam's Primary Schools* The University of Queensland].

Norman, E. (2020). Why Metacognition Is Not Always Helpful. *Frontiers in Psychology*. https://doi.org/ https://doi.org/10.3389/fpsyg.2020.01537

Nosratinia, M., Mirsafaee, Z., & Shakeri, H. (2013). The Effect of Teaching Concept Mapping in Reading on EFL Learners' Self-Regulation. . *IOSR Journal Of Humanities And Social Science (IOSR-JHSS)*, *18*(4), 10.

Noushad, p. p. (2008). *Cognition about Cognition: The theory of Metacognition*. Farook Training College.

Novak, J. (2004). The Theory Underlying Concept Maps and How To Construct Them.

Novak, J. D., & Canas, A. J. (2007). Theoretical Origins of Concept Maps, How to Construct them, and Uses in Education. *Reflecting Education*, *3*(1), 14.

Novak, J. D., & Canas, A. J. (2008). The Theory Underlying Concept Maps and How to Construct and Use Them. Technical Report IHMC CmapTools, Pensacola.

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge University Press.

Oliver, K. M. (2009). An Investigation of Concept Mapping to Improve the Reading Comprehension of Science Texts. *Journal of Science Education and Technology*. https://doi.org/10.1007/s10956-009-9157-3

Olshavsky, J. (1977). Reading as problem solving: An investigation of strategies. *Reading Research Quarterly*, *12*, 20.

Omar, A.-M. A. (2015). Improving Reading Comprehension by Using Computer-based Concept Maps: A Case of ESP Students at UMM-Alqura University. *British Journal of Education*, *3*(4), 20.

Österholm, M. (2007). A Reading Comprehension Perspective on Problem Solving. MADIF 5, the 5th Swedish Mathematics Education Research Seminar, Sweden.

Paivio, A. (2006). Dual Coding Theory and Education. Pathways to Literacy Achievement for High Poverty Children, The University of Michigan School of Education.

Palmerino, M. B. (2006). One-on-ones put the quality in qualitative. *qualitatively speaking*, 3.

Panadero, E. (2017). A Review of Self-regulated Learning: Six Models and Four Directions for Research. *Frontiers in Psychology*.

Panhwar, A. H., Ansari, S., & Shah, A. A. (2017). Post-positivism: an effective paradigm for social and educational research. *Sindh University Journal Online (SUJO)*.

Pannen, P. (2001). *Konstruktivisme dalam Pembelajaran*. PAU-PAAI-Universitas Terbuka Press.

Papanthymou, A. (2018). Student Self-Assessment in Higher Education: The International Experience and the Greek Example. *World Journal of Education*, *8*(6), 17.

Parrish, A. E., & Brosnan, S. F. (2012). Primate Cognition. In V. S. Ramachandran (Ed.), *Encyclopedia of Human Behavior* (2rd ed., pp. 7). Elsevier.

Phakiti, A. (2003). A Closer Look at the Relationship of Cognitive and Metacognitive Strategy Use to EFL Reading Achievement Test Performance. *Language Testing*, *20*(1).

Phakiti, A. (2006). Modeling cognitive and metacognitive strategies and their relationships to EFL reading test performance. *Melbourne Papers in Language Testing 2006*, *1*, 43.

Phantharakphong, P., & Pothitha, S. (2014). *Development of English Reading Comprehension by Using Concept Maps* 5th World Conference on Educational Sciences - WCES 2013

Phuc, N. T. H. (2020). A Study On Reading Strategies Used By Vietnamese High School English Language Learners. *International Journal of Scientific and Research Publications*, *10*(6), 14.

Pishghadam, R., & Ghanizadeh, A. (2011). On Validation of Concept Map as an Assessment Tool of L2 Reading Comprehension: A Triangulation Approach. *World Journal of English Language*, *1*(1), 17.

Pottier, P., Hardouin, J.-B., Hodges, B. D., Pistoriu, M.-A., Connault, J. r., Durant, C. c., Clairand, R., Sebille, V. r., Barrier, J.-H., & Planchon1, B. (2010). Exploring how students think: a new method combining think-aloud and concept mapping. *Teaching with Cognition*, *44*, 12.

Rabionet, S. E. (2011). How I Learned to Design and Conduct Semi-structured Interviews: An Ongoing and Continuous Journey. *Qualitative*, *16*(2), 2.

Raihan, A. (2011). 'Think-aloud' Techniques used in Metacognition to Enhance Self-regulated Learning. *Journal of Educational Research*, *25*(2), 35.

Ramrathan, L., Grange, L. L., & Higgs, P. (2017). *Education studies for initial teacher development*. Juta.

Rassaei, E. (2017). Effects of two forms of concept mapping on L2 reading comprehension and strategy awareness. *Applied Linguistics Review*, *10*(2).

Renandya, W. A. (2013). Essential Factors Affecting EFL Learning Outcomes. *English Teaching*, *68*(4), 18.

Rhodes, A. E., & Rozell, T. G. (2017). Cognitive flexibility and undergraduate physiology students: increasing advanced knowledge acquisition within an ill-structured domain. *Adv Physiol Educ*, *41*, 8.

Riahi, Z., & Pourdana, N. (2017). Effective Reading Comprehension in EFL Contexts: Individual and Collaborative Concept Mapping Strategies. *Advances in language and literacy studies*, *8*(1).

Richards, J. C. (2006). *Communicative Language Teaching Today*. Cambridge University Press.

Rintaningrum, R. (2008). Constructivist Theory and a Teaching and Learning Cycle in English. *Journal Social Humaniora*, *1*(1).

Rowbotham, M., & Schmitz, G. S. (2013). Development and Validation of a Student Self-efficacy Scale. *Journal of Nursing & Care*, *2*(1), 6.

Ryan, A. M., Pintrich, P. R., & Midgley, C. (2001). Avoiding Seeking Help in the Classroom: Who and Why? *Educational Psychology Review*, *13*(2), 22.

Ryan, G. (2018). Introduction to positivism, interpretivism and critical theory. *Nurse Researcher*, 20.

Sadoski, M., & Paivio, A. (2004). A dual coding theoretical model of reading. In R. B. Ruddell & N. J. Unrau (Eds.), *Theoretical models and processes of reading*. International Reading Association.

Sadosski, M., & Paivio, A. (2013). Concreteness and Imagery Effects in the Written Composition of Definitions. In D. E. Alvermann, N. J. Unrau, & R. B. Ruddell (Eds.), *Theoretical Models and Processes of Reading (6th Edition). Newark, DE, USA: International Reading Association.* (6th ed., pp. 16). International Reading Association.

Safdar, M., Hussain, A., Shah, I., & Rifa, Q. (2012). Concept Maps: An Instructional Tool to Facilitate Meaningful Learning. *European Journal of Education Studies*, *3*(3), 10.

Salehi, A. D., Jahandar, S., & Khodabandehlou, M. (2013). The Impact of Concept Mapping on EFL Students' Reading Comprehension. *Indian Journal of Fundamental and Applied Life Sciences*, *3*(3), 10.

Sandars, J. (2009). The use of reflection in medical education: AMEE Guide No. 44. *Medical Teacher*, *31*, 11.

Sanderson, L. (2010). Informed Consent in Educational Settings and the Novice Researcher. *KAIRARANGA*, *11*(1), 6.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, *52*, 15.

Sawyer, R. K. (2008). Optimising learning Implications of learning Science Research. OECD/CERI International Conference,

Schiff, R., & Calif, S. (2004). An Academic Intervention Program for EFL University Students With Reading Disabilities. *Journal of Adolescent & Adult Literacy*, *48*(2), 12.

Schwarzer, R., & Jerusalem, M. (1995). General Self-Efficacy. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs*. NFER-Nelson.

Schwendimann, B. A. (2014). Concept Maps. In R. Gunstone (Ed.), *Encyclopedia of science education*.

Seel, N. M. (2012). Assimilation Theory of Learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 324-326). Springer US. https://doi.org/10.1007/978-1-4419-1428-6_358

Seyedi, G. (2012). The Think-aloud Method in EFL Reading Comprehension. *International Journal of Scientific and Engineering Research*, *3*(9), 9.

Shaaban, K. (2001). Assessment of Young Learners. *Forum*, *39*(4), 16.

Shahnazari, M. T., & Dabaghi, A. (2014). A Critical Overview of Models of Reading Comprehension with a Focus on Cognitive Aspects *Research in English Pedagogy*, *2*(1), 13.

Shikano, M. (2014). Metacognition in Reading. *Nanzan University Repository*.

Sidek, H. M., & Rahim, H. A. (2015). *The Role of Vocabulary Knowledge in Reading Comprehension: A Cross-Linguistic Study* 7th World Conference on Educational Sciences, Athens, Greece.

Simone, C. D. (2007). Applications of Concept Mapping. *College Teaching*, 4.

Smith, R., Snow, P. C., Serry, T., & Hammond, L. (2021). The Role of Background Knowledge in Reading Comprehension: A Critical Review. *Reading Psychology*.

Smythe, I. (2010). *Concept Map Rubrics*

Soleimani, H., & Nabizadeh, F. (2012). The Effect of Learner Constructed, Fill in the Map Concept Map Technique, and Summarizing Strategy on Iranian Pre-university Students' Reading Comprehension. *English Language Teaching*, *5*(9), 10.

Solochak, T., & Pesina, S. (2014). Concept and its structure. 2nd GLOBAL CONFERENCE on LINGUISTICS and FOREIGN LANGUAGE TEACHING, LINELT, Dubai - United Emirates.

Son, L. T. (2011). *Teaching English in Vietnam : improving the provision in the private sector* Victoria University]. Melbourne, Australia.

Soto, C., Blume, A. P. G. d., Mathew Jacovina3, D. M., & Riffo, N. B. a. B. (2019). Reading comprehension and metacognition: The importance of inferential skills. *Educational Psychology and Councelling*, *6*, 20.

Spencer, J. (2018). *Five ways to boost metacognition in the classroom* https://spencerauthor.com/metacognition/

Spiro, R. J., Collins, B. P., Thota, J. J., & Feltovich, P. J. (2003). Cognitive Flexibility Theory: Hypermedia for Complex Learning, Adaptive Knowledge Application, and Experience Acceleration. *Educational Technology*, *43*(5), 6.

Spiro, R. J., & Jehng, J. C. (1990). Cognitive Flexibility and Hypertext: Theory and Technology for the Nonlinear and multidimensional traversal of complex subject matter. In D. Nix & R. J. Spiro (Eds.), *Cognition, education, and multimedia: Exploring ideas in high technology*. Lawrence Erlbaum Associates, Inc.

Springer, S. E., Harris, S., & Dole, J. A. (2017). From Surviving to Thriving: Four Research-Based Principles to Build Students' Reading Interest. *The Reading Teacher*, *71*(1), 8.

Stamps, L. (2004). The Power of Authentic Learning. *Classroom Leadership*, *8*(2).

Suhermanto, H. (2019). The Effect of Fix Up Strategy in Enhancing Students' Reading Comprehension in IAIN Curup. *ENGLISH FRANCA : Academic Journal of English Language and Education*, *3*(1), 14.

Suresh, K., & Chandrashekara, S. (2012). Sample size estimation and power analysis for clinical research studies. *J Hum Report Sci*, *5*(1), 7. https://doi.org/10.4103/0974-1208.97779

Syed, M., & Nelson, S. C. (2015). Guidelines for Establishing Reliability When Coding Narrative Data. *Emerging Adults*.

Symonds, J. E., & Gorard, S. (2008). *The Death of Mixed Methods: Research Labels and their Casualties* The British Educational Research Association - Anual Conference, Edinburgh.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Allyn & Bacon/ Pearson Education.

Tabatabaei, O., & Khalili, S. (2014). The Effect of Concept Mapping on Iranian Preintermediate L2 Reading Comprehension. *Journal of Language Teaching and Research*, *5*(6), 13.

Tafazoli, D., Tafazoli, E., & Bakhshi, E. M. (2017). Vocabulary Learning through Concept Mapping: Conventional Instruction vs. Online Concept Mapping. 7th International Conference on Cognitive Science Institute for Cognitive Science Studies, Tehran, Iran.

Tajeddin, Z., & Tabatabaei, S. (2016). Concept Mapping as a Reading Strategy: Does It Scaffold Comprehension and Recall? . *The Reading Matrix*, *15*(1), 15.

Tam, N. T. D. (2018). *English language teacher education in Vietnam: A Case Study of Localised Approaches to the Concept of Method at a Rural Vietnamese College* University of Technology Sydney].

Taplin, M., Yum, J. C. K., Jegede, O., Fan, R. Y. K., & Chan, M. S.-c. (2001). *Help-Seeking Strategies Used by High-Achieving and Low-Achieving Distance Education Students* 13th Annual Conference of the Asian Association of Open Universities, Beijing, China.

Tavakol, M., & Dennick, R. (2011). Making Sense of Cronbach's Alpha. *2*, 3.

Teo, A., Shaw, Y. F., Chen, J., & Wang, D. (2016). Using Concept Mapping to Teach Young EFL Learners Reading Skills. *English Teaching Forum*, 7.

Tergan, S. O., & Keller, T. (2005). *Knowledge and Information Visualisation: Searching for Synergies*. Springer.

Thao, N. T. M., & Lap, T. Q. (2011). Learners' Metacognitive Strategy Use and Reading Comprehension: Insights from a Vietnamese Context. *i-manager's Journal on English Language Teaching*, *1*(1), 11.

Thao, T. Q., & Son, T. T. (2018). *The Factors Influencing EFL Comprehensibility among Vietnamese Secondary School Students: A Case Study* Language Teaching and Learning Today: Diversity and Unity of Language Education in the Globalised Landscape, Ho Chi Minh City.

Thao, T. Q., & Tham, D. M. (2018). The Difficulties in Reading Comprehension Encountered by English-Majored Students. *VNU Journal of Foreign Studies*, *34*(2), 11.

Thu, H. T., & Ha, P. T. T. (2019). Factors Affecting First-year AP Students' Reading Comprehension at Thai Nguyen University of Technology. *TNU Journal of Science and Technology*, *196*(3), 4.

Thu, L. M., Anh, K. H., & Nam, N. T. P. (2019). Effects of Cognitive Reading Strategies Training on Reading Performance of EFL Students: A Case of a High School in Vietnam. *Dalat University Journal of Science (Social Science and Humanities)*, *9*(4), 19.

Thuong, N. (2017). Vietnam's National Foreign Language 2020 Project after 9 years: A Difficult Stage. The Asian Conference on Education & International Development Taiwan.

Thuy, N. B. (2018). Reading Strategies used by EFL and ESL university students. *VNU Journal of Foreign Studies*, *34*(2), 13.

Thuy, N. T. B. (2019). *EFL Collaborative Learning in a Vietnamese University: Perceptions of Experiences of Students and Teachers* University of Sydney].

Thuy, N. T. T. (2020). Metacognitive Awareness of Using Reading Strategies by TESOL Postgraduates Intakes 11 and 12 at Ho Chi Minh City Open University. *Theory and Practice in Language Studies*, *10*(2), 10.

Tobias, S., & Duffy, T. M. (2009). *Constructivist instruction: Success or failure?* Taylor & Francis.

Todd, R. (2002). Using self assessment for evaluation. *English Teaching Forum*, *40*(1), 4.

Trang, H. T. H., & Anh, N. T. N. (2017). Developing English Language Reading Comprehension Amongst EFL/ESL Learners Through Culturally Relevant Texts. *Journals of Sciences and Technology - Thai Nguyen University*, *174*(14), 6.

Trang, N. T. T. (2012). *The Impact of Background Knowledge and Time Constraint on Reading Comprehension of Vietnamese Learners of English as Second Language* Southern Illinois University Carbondale]. Illinois.

Trang, P. T. (2017). The Effects of Concept Mapping on EFL Students' Reading Comprehension. *European Journal of English Language Teaching*, *2*(2), 30.

Trifone, J. (2017). *Fostering Meaningful Learning in the 21st Century Classroom*. The Graduate Institute.

Tsai, C. (2001). A Review and Discussion of Epistemological Commitments, Metacognition, and Critical Thinking with Suggestion on Their Enhancement in Internet-Assisted Chemistry Classrooms. *Journal of Chemical Education*, *78*(7), 5.

Tuan, L. T., & Thuan, L. T. B. (2011). The Linkages between Concept Maps and Language Learning. *Studies in Literature and Language*, *2*(1), 17.

Tuncel, H. (2015). The relationship between self-confidence and learning Turkish as a foreign language. *Educational Research and Reviews*, *10*(18), 14.

Usman, B., Maidatija, R., & Fitriani, S. S. (2017). Improving Concept Mapping to Improve Reading Comprehension. *English Education Journal (EEJ)*, *8*(3), 16.

Van, D. T. T., Hieu, H. T. T., Hoa, B. T. H., & Tam, N. T. T. (2017). An Investigation in the Difficulties in ESP Reading Comprehension of Second Year Students at Quy Nhon University. *Journal of Science - Quy Nhon University*, *11*(2), 9.

Van, H. V. (2010). The Current Situation and Issues of the Teaching of English in Vietnam. *立命館言語文化研*, *22*(1), 19.

Vanhear, J., & Johnston, C. A. (2006). *Vee Heuristics, Concept Mapping And Learning Patterns: Merging Metacognitive Tools And Learning Processes To Improve Facilitation Of Learning With Primary Children* Second International Conference on Concept, San Jose, Costa Rica.

Vanhove, J. (2015). Analyzing randomized controlled interventions: Three notes for applied linguists. *Studies in Second Language Learning and Teaching*, *5*(1), 18.

Veeravagu, J., Muthusamy, C., Marimuthu, R., & Michael, A. S. (2010). Using Bloom's Taxonomy to Gauge Students' Reading Comprehension Performance. *canadian Social Science*, *6*(3), 8.

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

Wagaba, F., Treagust, D. F., Chandrasegaran, A. L., & Won, M. (2016). Using metacognitive strategies in teaching to facilitate understanding of light concepts among year 9 students. *Research in Science and Technological Education*, *34*(3), 20.

Wang, C.-C., Ho, H.-C., Wu, J.-J., & Cheng, Y.-Y. (2014). Development of the scientific imagination model: A concept-mapping perspective. *Thinking Skills and Creativity*, *13*, 13.

White, M. C. (2011). Predicting Success in Teacher Certification Testing: The Role of Academic Help Seeking *The International Journal of Educational and Psychological Assessment*, *7*(1), 20.

Wilkins, D. A. (1972). *Linguistics in Language Teaching*. Edward Arnold.

Wilson, N. S., & Smetana, L. (2011). Questioning as thinking: a metacognitive framework to improve comprehension of expository text. *Literacy*, *45*(2), 7.

Woolfolk, A. (2004). *Educational Psychology* (9th ed.). Allyn and Bacon.

Yen, D. T. H. (2019). *The Need For Academic Reform In Vietnamese Higher Education (VHE) To Align With Employers' Expectations* University of New England].

Yoğurtçu, K. (2013). The impact of self-efficacy perception on reading comprehension on academic achievement. *Procedia-Social and Behavioral Sciences*, *70*(11).

Yokoyama, S. (2018). Academic Self-Efficacy and Academic Performance in Online Learning: A Mini Review. *Frontiers in Psychology*, *9*.

Young, A., & Fry, J. D. (2008). Metacognitive Awareness and Academic Achievement in College Students. *Journal of the Scholarship of Teaching and Learning*, *8*(2), 10.

Yousofi, N., & Seidi, N. (2015). The Impact of Concept Mapping Technique on EFL Reading Comprehension: A Case Study. *International Journal of Language Learning and Applied Linguistics World (IJLLALW)*, *8*(1), 10.

Yuksel, I. (2012). Activating students' Prior Knowledge: The Core Strategies. *World Applied Sciences Journal*, *20*(8), 5.

Zhang, D., & Zhang, L. J. (2019). Metacognition and self-regulated learning (SRL) in second/foreign language teach. In X. Gao (Ed.), *Second Handbook of English Language Teaching*. Springer Nature.

Zimmerman, B. J. (2015). Self-Regulated Learning: Theories, Measures, and Outcomes. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences* (2nd ed.). Elsevier.

Appendix

Appendix 1 - A

Pre-Test for Reading Comprehension. Time allowed: 30 minutes.

Name: …………………………………

Group: …………………………………………….

Read carefully the following texts and choose the suitable answer for the given questions:

Reading Passage1:

When another old cave is discovered in the South of France, it is not usually news. Rather, it is an ordinary event. Such discoveries are so frequent these days that hardly anybody pays heed to them. However, when the Lascaux cave complex was discovered in 1940, the world was amazed. Painted directly on its walls were hundreds of scenes showing how people lived thousands of years ago. The scenes show people hunting animals, such as bison or wild cats. Other images **depict** birds and, most noticeably, horses, which appear in more than 300 wall images, by far outnumbering all other animals. Early artists drawing these animals accomplished a monumental and difficult task. They did not limit themselves to the easily accessible walls but carried their painting materials to spaces that required climbing steep walls or crawling into narrow passages in the Lascaux complex. Unfortunately, the paintings have been exposed to the destructive action of water and temperature changes, which easily wear the images away. Because the Lascaux caves have many entrances, air movement has also damaged the images inside. Although they are not out in the open air, where natural light would have destroyed them long ago, many of the images have deteriorated and are barely recognizable. To prevent further damage, the site was closed to tourists in 1963, 23 years after it was discovered.

1. When did they discover the Lascaux cave complex?
a. 1920
b. 23 years after the discovery of South France
c. 1963
d. Recently

2. What was the reason for the destruction of the painting in the cave?
a. Birds and horses
b. Entrances
c. Bison or wild cats

d.   Water and temperature change

3.   According to the passage, which animals appear most often on the cave walls?

a.   Birds

b.   Bison

c.   Horses

d.   Wild cats

4.   In line 6, the word 'depict' is closest in meaning to …………………

a.   Show

b.   Count

c.   Draw

d.   Hunt

5.   Why was painting inside the Lanscaux complex a difficult task?

……

……

……

………………………………

6.   According to the passage, what happened at the Lanscaux cave in 1963?

……

……

……

………………………………

Reading Passage 2:

Something very strange happened to Tamara. She never knew she had a twin sister until she started university!

Tamara was born in Mexico. Her parents could not look after her so she went to live with a family in Manhattan, USA.

When Tamara was twenty years old, she started university in Long Island. She enjoyed her university life. But one day she was walking home from class, and a student smiled at her. "Hello Adriana!" said the student. "I'm not Adriana," said Tamara.

This happened to Tamara again and again. People Tamara didn't know kept calling her Adriana. It was very strange. One day, when a woman called her Adriana, Tamara asked "Why do you keep calling me Adriana?"

The woman replied, "You look like my friend Adriana. You have the same face and the same hair. Is Adriana your sister?" Tamara said that she did not have a sister called Adriana. But she was interested in this girl Adriana. Finally, she asked someone for Adriana's email address.

When Tamara wrote to Adriana, she found out that they both had the same birthday, they looked the same and both of them were from Mexico. When Tamara went to live with the family in Manhattan, Adriana moved to Long Island to live with a family there. It had to be true! Adriana and Tamara were twin sisters!

7.   Which is the appropriate title for the reading passage?

a. The story of an adopted girl

b. A girl finds out her twin sister in a special way

c. Tamara and her student life

d. Tamara and Andriana: a story of people with the same looks

8. Where was Andriana born?

a. In Long Island

b. In Manhattan

c. In Mexico

d. In the USA

9. What does ''twin'' (line 1) mean?

a. People being born at the same time by the same parents

b. People studying in the same university

c. People living in the same area

d. People writing emails to each other

10. Why did people call Tamara ''Andriana''?

a. Because they are in the same class

b. Because they live in the same family

c. Because they have the same birthday

d. Because they look alike

11. Why didn't Tamara and Andriana live in the same family?

………

………

………

………………………………

12. How did Tamara find out that she had a twin sister?

………

………

………

………………………………...

End of test

Thank you!

Post-Test for Reading Comprehension. Time allowed: 30 minutes

Name: …………………………………

Group: ……………………………………………….

Read carefully the following texts and choose the suitable answer for the given questions:

Reading Passage1:

When another old cave is discovered in the South of France, it is not usually news. Rather, it is an ordinary event. Such discoveries are so frequent these days that hardly anybody pays heed to them. However, when the Lascaux cave complex was discovered in 1940, the world was amazed. Painted directly on its walls were hundreds of scenes showing how people lived thousands of years ago. The scenes show people hunting animals, such as bison or wild cats. Other images **depict** birds and, most noticeably, horses, which appear in more than 300 wall images, by far outnumbering all other animals. Early artists drawing these animals accomplished a monumental and difficult task. They did not limit themselves to the easily accessible walls but carried their painting materials to spaces that required climbing steep walls or crawling into narrow passages in the Lascaux complex. Unfortunately, the paintings have been exposed to the destructive action of water and temperature changes, which easily wear the images away. Because the Lascaux caves have many entrances, air movement has also damaged the images inside. Although they are not out in the open air, where natural light would have destroyed them long ago, many of the images have deteriorated and are barely recognizable. To prevent further damage, the site was closed to tourists in 1963, 23 years after it was discovered.

1. When was the Lascaux cave complex discovered?

a. 1963

b. 23 years after the discovery of South France

c. 1940

d. Recently

2. What destroyed the painting in the cave?

a. Water and temperature change

b. Birds and horses

c. Entrances

d. Bison or wild cats

3.   According to the passage, which animals appear most often on the cave walls?

a.   Birds

b.   Bison

c.   Horses

d.   Wild cats

4.   In line 6, the word 'depict' is closest in meaning to ………………….

a.   Show

b.   Hunt

c.   Count

d.   Draw

5.   Why was painting inside the Lanscaux complex a difficult task?

……

……

……

……………………….

6.   According to the passage, what happened at the Lanscaux cave in 1963?

……

……

……

……………………..

Reading Passage 2:

Something very strange happened to Tamara. She never knew she had a twin sister until she started university!

Tamara was born in Mexico. Her parents could not look after her so she went to live with a family in Manhattan, USA.

When Tamara was twenty years old, she started university in Long Island. She enjoyed her university life. But one day she was walking home from class, and a student smiled at her. "Hello Adriana!" said the student. "I'm not Adriana," said Tamara.

This happened to Tamara again and again. People Tamara didn't know kept calling her Adriana. It was very strange. One day, when a woman called her Adriana, Tamara asked "Why do you keep calling me Adriana?"

The woman replied, "You look like my friend Adriana. You have the same face and the same hair. Is Adriana your sister?" Tamara said that she did not have a sister called Adriana. But she was interested in this girl Adriana. Finally, she asked someone for Adriana's email address. When Tamara wrote to Adriana, she found out that they both had the same birthday, they looked the same and both of them were from Mexico. When Tamara went to live with the family in Manhattan, Adriana moved to Long Island to live with a family there. It had to be true! Adriana and Tamara were twin sisters!

7.   Choose appropriate title for the reading passage

a.   Tamara and her student life

b. The story of an adopted girl

c. A girl finds out her twin sister in a special way

d. Tamara and Andriana: a story of people with the same looks

8. Where was Andriana born?

a. In Long Island

b. In Manhattan

c. In Mexico

d. In the USA

9. What does ''twin'' (line 1) mean?

a. People being born at the same time by the same parents

b. People studying in the same university

c. People living in the same area

d. People writing emails to each other

10. Why did people call Tamara ''Andriana''?

a. Because they are in the same class

b. Because they live in the same family

c. Because they have the same birthday

d. Because they look alike

11. Why did Tamara and Andriana live in different families?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
………………………

12. How did Tamara find out that she had a twin sister?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
………………………..

End of test

Thank you!

Appendix 2

Survey questionnaires on Metacognition

This questionnaire is used for a study to understand how computational concept mapping influences students' metacognition, hence academic performance in reading comprehension classes.

There are three parts of the survey: Part 1 is about demographic information, Part 2 asks about students' use of metacognitive strategies.

- Please read each question carefully and select the answers you prefer

- Please follow the instructions next to each question; they will tell you how to respond.

- Please make sure you read all the instructions before each question, these are really important in helping you understand the questions.

- The survey will take you approximately 10 minutes to complete.

- Thank you for your support and participation!

Part 1: Demographic information

The first section asks you some demographic questions about you. Your identity is kept anonymous.

1. How old are you?
a. 18
b. 19
c. 20
d. Over 20

What is your nationality? ………………………………………..

2. Have you ever used information technology (IT) to support your learning or practising your English language?
a. Yes
b. No

Part 2 Your Metacognitive Strategies

(Circle your choice: 1: Never, or Almost never do this, 2: I do this; 3: I often do this (about 50% of the time); 4: I usually do this; 5: I always or almost always do this.)

Metacognitive Strategy reading inventory

1. I was aware of what and how I was doing the CCMAL activity (MOR)
1　　2　　3　　4　　5

2. I checked my own performance and progress while completing the concept maps. (EVL)

1   2   3   4   5

3.   I thought through the meaning of the concept maps before start constructing them. (EVL)

1   2   3   4   5

4.   I was aware of which strategy to use and how and when to use it. (MOR)

1   2   3   4   5

5.   I corrected mistakes immediately when found. (MOR)

1   2   3   4   5

6.   I asked myself how the concept maps and the given texts related to what I already knew. (EVL)

1   2   3   4   5

7.   I determined what the CCMAL task requires me to do. (PLAN)

1   2   3   4   5

8.   I was aware of the need to plan a course in action. (PLAN)

1   2   3   4   5

9.   I was aware of how much the concept maps remained to be completed. (EVL)

1   2   3   4   5

10.   I made sure I understood what had to be done and how to do it (PLAN)

1   2   3   4   5

11.   I was aware of my on-going reading and concept mapping (MOR)

1   2   3   4   5

12.   I make sure to clarify the goal and know how to complete it. (PLAN)

1   2   3   4   5

13.   I checked my accuracy as I progressed through the concept mapping (EVL)

1   2   3   4   5

End of survey

After this survey, we also have individual interviews which will be recorded as a source of data for the study. Are you willing to take part in the audio-recorded interviews?

Yes   No

If yes, please leave your contact details.

Your phone number: ………………………..

Your email address: ………………………..

Other types of contact (e.g., Messenger, Instagram, Zalo, Viber, etc.) ……………….

Contact type preferred: phone   email   others

Your prefer contact time: …………………..date: ………………………(No later than 31/12/2018)

Or book you in at
https://docs.google.com/spreadsheets/d/1UE6jk4xvCAzuErs0wbmpmaiiTgIuboVyodrAL38DzbM/edit#gid=0

Thank you!

Appendix 3

General Self-Efficacy Scale (GSE)

	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough	☐	☐	☐	☐
2. If someone opposes me, I can find the means and ways to get what I want.	☐	☐	☐	☐
3. It is easy for me to stick to my aims and accomplish my goals.	☐	☐	☐	☐
4. I am confident that I could deal efficiently with unexpected events.	☐	☐	☐	☐
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	☐	☐	☐	☐
6. I can solve most problems if I invest the necessary effort.	☐	☐	☐	☐
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	☐	☐	☐	☐
8. When I am confronted with a problem, I can usually find several solutions.	☐	☐	☐	☐
9. If I am in trouble, I can usually think of a solution	☐	☐	☐	☐
10. I can usually handle whatever comes my way.	☐	☐	☐	☐

Appendix 4

Learning journals

Name: ……………………………… Date/ week: …………

(you can write up to 200 words for each question)

Describe your learning when creating CCMAL in class

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

…………………………………………………………………………………………..

Things you like about concept mapping is (e.g., the skills you learned)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

…………………………………………………………………………………………

The difficulties you have in concept mapping are …, and how you addressed the difficulties

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

…………………………………………………………………………………………..

Other thoughts about concept mapping (what factors influenced your concept mapping)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

…………………………………………………………………………………………

Appendix 5

Interview protocols

**Research: A study of the use of computer-based concept mapping to enhance EFL learners'
metacognition in reading comprehension classes**

1.   Interviewee information

M/F

Group:

2.   Introduction and verbal consent

I am interested to know how you use CCMAL in reading comprehension class. I am
interested in how you organize information when you comprehend a text. You should
feel free to say what you think because there is no right or wrong answer.

The expected length of the interview is 30 to 40 minutes and I will audio-record your
voice because capturing what you say is important. But I will not pass this information
to anyone else except those involved in this study. Are you willing to be recorded?

Verbal Consent was obtained from the study participant   ………………

Verbal Consent was NOT obtained from the study participant   ………………

3.   General questions

-         Do you like learning reading comprehension?

o   Why?

o   Why not?

-         Do you think that reading comprehension is important in learning another
language?

o   Why?

o   Why not?

-         Which language skill do you spend most of the time learning?

o   How much time?

o   Why?

4.   Use of CCMAL

4.1.   Can you describe to me your experience in learning reading comprehension
using CCMAL?

- The most enjoying part of CCMAL.

- The skills you develop.

- The collaborative working

- Individual working.

- The reading comprehension skills you used

4.2.   How does CCMAL help you to comprehend a text?

- It helps you to organize information visually.

- It helps you to learn vocabulary quickly.

- It helps you to connect ideas reasonably.

4.3.   How does CCMAL help you to organize information in reading comprehension?

- It helps you to arrange information based on the order of time.

- It helps you to arrange information based on the relationships.

- It helps you to arrange information based on the order of the process.

4.4.   What are the difficulties or challenges you encounter with CCMAL in reading comprehension class?

- You have trouble with technical devices?

- You have trouble with arranging concepts?

- You have trouble with deciding the links between the concepts?

- You have trouble with making interlinks between concept?

4.5.   What are the strategies to use CCMAL when you had difficulties in reading comprehension?

- You ask your teacher.

- You spend more time thinking.

- You ask your peers.

- You speak aloud what you were thinking.

- You ask yourself related questions.

4.6.   Do you like the topics of the reading texts?

- Why?   Why not?

\-   What topics do you like? Why?

4.7.   How do you think familiar topics help you learn reading comprehension better?

4.8.   What are the factors that influence your experience in learning with CCMAL?

\-   Why? More elaboration.

4.9.   Do you have any suggestions for better learning reading comprehension using CCMAL?

Thank you very much for your help!

Appendix 6

University of Minnesota's Concept Map Assessment Rubrics (2005)

Criteria	Excellent	Good	Adequate	Marginal	No Credit: is unacceptable to review
Structure	Non-linear structure that provides a very complete picture of your ideas	Non-linear structure that provides a complete picture of your ideas	Non-linear structure that provides a picture of your ideas	Non-linear structure that shows some relationships between ideas	Inappropriate structure
Relationship	Relative importance of ideas is indicated and both simple and complex relationships are very effectively mapped	Relative importance of ideas is indicated, and relationships are very effectively mapped	Relative importance of ideas is indicated, and relationships mapped	Importance is evidence but not very distinctive: relations are somewhat clear but lacking	No differentiation between ideas: no evidence of meaningful relationships
Exploratory	Map shows complex thinking about the meaningful relationship between ideas, themes, and the framework	Map shows effective thinking about the meaningful relationship between ideas, themes, and the	Map shows definite thinking about the relationship between ideas, themes, and the	Map shows some thinking about relationships between ideas, themes, and the framework	Thinking process is not clear
Communication	Information is presented clearly and allows for a high level of understanding	Information is presented clearly and allows for a good level of understanding	Information is presented clearly and allows for a basic level of understanding	Information is presented and some understanding can be gained	Information is not clear, very difficult to understand

Appendix 7

Observation Fieldnotes

Group: ………………………….. Week: ……………

Lesson: ………………………………….. Date of observation: …………………………

Room: …………………………………

1, How do students engage in CCMAL/ classroom activities?

……………………………………………………………………………………………………

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……………………………………………………………………………………………

2. What are students' attitudes toward CCMAL/ classroom activities?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………

3. What difficulties do students encounter in CCMAL/ classroom activities?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………

4. Special cases/ notes about the lesson or classroom practice

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………

Appendix 8

Advertisement for Participant Recruitments

Appendix 9

Coding Audit Trails

Codes	Summary of proposed modifications	Justification of proposed modifications	Data sources
Line-by-line coding technique	Dividing the lines flexibly due to the meaning conveyed in the segments	Meaning of a sentence is incomplete at times	Interviews Learning Journals Observation
CCMAL helps to understand texts better CCMAL helps to understand texts quickly CCMAL assists text comprehension	Merge these codes into ''CCMAL assisting text comprehension''	The meanings of these codes are similar, and all refer to the benefit of CCMAL in assisting students' text comprehension.	Interviews Learning journals
Looking up dictionaries	Looking up for unfamiliar words	Students look up words from dictionaries or translation apps or online.	Interviews Learning journals
Visualising skill	Merged into "Assisting language learning skills''	Visualising is a metacognitive reading skill.	Interviews
Making a clear cut between concept maps and mind maps	Concept map-mind map distinguishion	Language use	Interviews
Developing logical thinking skill	Merged with "developing critical thinking skill''	Logical thinking is a part of critical thinking	Interviews
Familiar topics	Changed into	Topics of reading texts are	Interviews

	"Experience relevant topics"	familiar to students' daily life experience	Learning journals Observation
Guessing the unknown words	Word contextualisation	Language use	Interviews Learning journals
Spending more time for thinking	Changed into "Self-effort"	Language use	Interviews Learning journals
Asking for the teacher's help Asking for classmates' help Self-effort	Merged into "help-seeking"	A theme for metacognitive strategies.	Interviews Learning journals Observation
Prior experience in concept mapping	Changed into "prior knowledge in concept mapping"	Students' knowledge ins constructed from experience	Learning journals
Prior experience in IT use	Changed into "prior knowledge in IT use"	Students' knowledge in constructed from experience	Learning journals
CCMAL helps students find detailed ideas	Changed into "Scanning for detailed information"	Language use	Learning journals Interviews
CCMAL helps students find main ideas	Changed into "Skimming for main ideas"	Language use	Learning journals Interviews
Cmap is easy to use Cmap is use-friendly	Merged into "Students' preference for	Justification for students' preference for CCMAL	Learning journals Interviews

	CCMAL"		
Connecting sentences	Changed into "connecting ideas"	Ideas are conveyed in sentences	Learning journals
Students talked to themselves	Changed into "thinking-aloud"	Language use	Learning journals
Students asked themselves questions	Changed into "self-questioning"	Language use	Learning journals
Creating images in mind

Creating mental images | Merged into "imagery" | Imagery refers to creating mental images for comprehending the text | Learning journals

Interviews |

Appendix 10

Participant Information Sheet – For Teachers

Project Title: A Study of the Use of Computational Concept Mapping Situated in Authentic Learning context to Enhance English as Foreign Language Students' Metacognition in reading comprehension classes

Project Summary: The project aims to identify the influence of Computational Concept Mapping situated in Authentic Learning context (CCMAL) on EFL learners' reading metacognition in reading comprehension classes using the CCMAL as the intervention in the reading comprehension class. The reading course will be conducted within 7 weeks and students will have a chance to work with CCMAL during the course.

You are invited to participate in a research study being conducted by

Huong Le, PhD Candidate of Higher Degree Research, School of Education, Western Sydney University – under the Supervision of:

1, A/P Chwee Beng Lee

Director, Higher Degree Research

School of Education, Western Sydney University

2, Dr. Lynde Tan

Lecturer (Primary Literacy Curriculum & Pedagogy)

Academic Literacy Advisor (Primary)

School of Education, Western Sydney University

How is the study being paid for?

The project is funded by Western Sydney University's Candidature Fund. By participating this project, you will be paid a 200$ gift voucher.

What will I be asked to do?

The teacher: You will be invited to conduct the experimental course which is a session of two hours each week for seven consecutive weeks. You will be conducting the course for both experimental and control group. You will also be asked to co-design a pre-test and a post-test of reading comprehension with the researcher. After the intervention, you will conduct another CCMAL reading comprehension course for students of the control group in collaboration with the researcher.

The Student Coordinator: You will be invited to help the researcher in recruiting and managing the participants for this project. You will decide the rooms to deliver the PIS and the ICF. Together with the researcher, you will go to these rooms to deliver these documents on each chair. You will be assisting in collecting the ICF from the students who register for the study, make up the list of participants and keep record of their attendance during the course.

The Independent Assessor: You will be invited to assess 10% of the reading comprehension tests done by students before and after the intervention. You will also be invited to assess 10% of the concept maps collected from participants in the experimental course based on the concept map assessment rubrics.

How much of my time will I need to give?

The teacher: you will be conducting the course for seven consecutive weeks, a session of two hours a week for each group. Co-designing a 30-minute test of reading comprehension test which may take you approximately two hours and you will be co-designing both pre and post-tests.

The Student Coordinator: PIS and ICF delivery will take approximately three hours and collecting ICF from participants will take you about a week. During seven weeks of intervention, you will be assisting with managing the participants and checking their attendance.

The Independent Assessor: You will be invited to assess 10% of the pre and post reading comprehension tests which are conducted before and after the intervention. The pre and post-tests will be done by participants in both groups, so there will be about 100 pre-tests and 100 post-tests. This means that you will be invited to assess approximately 10 pre-tests and 10 post-tests. Assessing reading comprehension tests will take you approximately 2 hours. You will also be invited to assess 10% of students' concept maps constructed during their reading lessons at week 1, week 4 and week 7. 50 concept maps will be constructed by 50 students in the experimental group each week. The concept maps will be collected at week1, week 4 and week 7, so the total number of the concept maps to be assessed is about 150 and the independent assessor will assess approximately 15 concept maps. Assessing the concept maps may take you 2 hours of working.

What benefits will I, and/or the broader community, receive for participating?

By participating in this project, you will have a chance to reinforce your research knowledge and skills. By working with the researcher in the steps of data collection, you will be involved in a collaborative working experience.

This project proposes a new teaching method which can positively influence EFL learners' metacognition in reading comprehension classes, thus it can help to improve the EFL academic achievements of Vietnamese university students.

The results of this project can provide valuable information for the EFL teaching and learning at Vietnamese universities, thus it will exert meaningful implications for policy makers as well as educators.

This project also adds to the scholarly research literature in the fields of reading comprehension, concept mapping and metacognition.

Will the study involve any risk or discomfort for me? If so, what will be done to rectify it?

This study will be conducted during seven consecutive weeks excluding the data collection before and after the intervention. Thus it is time burdened for the teachers as well as the students.

How do you intend to publish or disseminate the results?

It is anticipated that the results of this research project will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that you cannot be identified, except with your permission.

Can I withdraw from the study?

Participation is entirely voluntary and you are not obliged to be involved. If you do participate you can withdraw at any time without giving reason. If you do choose to withdraw from the study, you need to inform the researcher a week beforehand so that she can find another substitution.

What if I require further information?

Please contact *Huong Le* should you wish to discuss the research further before deciding whether or not to participate.

Huong Le

PhD Candidate of High Degree Research, School of Education, Western Sydney University.

Phone: + 61 406 917 967   + 84 974 310 555

Email: 18581401@student.westernsydney.edu.au

Principal Supervisor:

A/P Chwee Beng Lee

Director of Higher Degree Research

School of Education, Western Sydney University

P: +61 2 47360719   Email: chwee.lee@westernsydney.edu.au

What if I have a complaint?

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form. The information sheet is for you to keep and the consent form is retained by the researcher/s.

This study has been approved by the Western Sydney University Human Research Ethics Committee. The Approval number is H12893

Appendix 11

Informed Consent Form – For Teachers

Project Title: A Study of the Use of Computational Concept Mapping Situate in an Authentic Learning Contexts to Enhance English as a Foreign Language Learners' Metacognition in Reading comprehension class.

I, …………….(teacher's name), hereby consent to participate in the above named research project.

I acknowledge that:

• I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher.

• The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to:

Tick all the appropriate box(es)

☐ **Conducting the experimental reading course using concept mapping activities.**

☐ **Co-designing reading tests for the participants.**

☐ **Delivering the PIS and ICF to different classrooms**

☐ **Marking 30% of participants' reading comprehension tests**

☐ **Conducting interrater coding for 30% of qualitative data**

I understand that my involvement is confidential, and that the information gained during the study may be published and stored for five years but no information about me will be used in any way that reveals my identity.

I understand that participation is entirely voluntary, and I can withdraw from the study at any time without affecting my relationship with the researcher and any organisations involved, now or in the future. In case of withdrawing from the study, I will notify the researcher a week beforehand.

Signed:

Name:

Date:

This study has been approved by the Human Research Ethics Committee at Western Sydney University. The ethics reference number is: H12893

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Appendix 12

Participant Information Sheet – Students

Project Title: A Study of the Use of Computational Concept Mapping Situated in Authentic Learning context to Enhance English as a Foreign Language Students' Reading metacognition in reading comprehension classes

Project Summary: The project aims to identify the influence of Computational Concept Mapping situated in Authentic Learning context (CCMAL) on EFL learners' reading metacognition in Vietnam using the CCMAL as the intervention in the reading comprehension class. The reading course will be conducted within 7 weeks and students will have a chance to work with CCMAL during the course.

You are invited to participate in a research study being conducted by

Huong Le, PhD Candidate of Higher Degree Research, School of Education, Western Sydney University – under the Supervision of:

1, Assoc. Prof. Chwee Beng Lee

Director, Higher Degree Research

School of Education, Western Sydney University

2, Dr. Lynde Tan

Lecturer (Primary Literacy Curriculum & Pedagogy)

Academic Literacy Advisor (Primary)

School of Education, Western Sydney University

How is the study being paid for?

The project is funded by Western Sydney University's Candidature Fund. However, this fund is only used to cover the most essential parts of the study. By participating this project, you will not be paid for your participation.

What will I be asked to do?

You will be invited to take part in a reading course which will be conducted during 7 weeks. Before entering the reading course, you will be asked to do a reading comprehension test, a survey questionnaire on metacognition and a Questionnaire of General Self-Efficacy. During the course, you will be required to engage in the concept mapping activities as pre-reading activities. You will be asked to keep a booklet of journal entries to make your learning diary every week. After the reading course, you will be invited to do another reading comprehension test and another survey questionnaire. You may be invited to take part in an audio-recorded individual interview upon the completion of the course.

How much of my time will I need to give?

The reading comprehension course will be delivered a session of two hours a week during seven consecutive weeks. There will be two reading comprehension tests each of which will take you approximately 30 minutes to complete. You will complete a survey questionnaire before and another questionnaire after the reading course, 30 minutes should be spent for each questionnaire. The General Self-Efficacy will be completed within approximately 5 minutes. After the reading course, you will be asked to do another reading comprehension test which can be completed within 30 minutes and another survey questionnaire which will take you approximately 30 minutes. If you are selected for the audio-recorded individual interview, it will take you approximately 40 minutes.

What benefits will I, and/or the broader community, receive for participating?

 By participating in this project, you will have a chance to evaluate your reading comprehension ability and improve it. However, this project does not guarantee the radical improvements in reading comprehension abilities of the participants due to practical conditions.

This project proposes a new teaching method which can positively affect EFL learners' metacognition in Vietnamese context, thus it can help to improve the EFL academic achievements of Vietnamese university students.

The results of this project can represent the information for the EFL teaching and learning at Vietnamese universities, thus it will exert meaningful implications for policy makers as well as educators.

This project also adds to the scholarly research literature in the fields of metacognition, reading comprehension, concept mapping and metacognition.

Will the study involve any risk or discomfort for me? If so, what will be done to rectify it?

This study will be conducting for seven consecutive weeks and a session of two hours each week and it may cause more workload for the students beside their official learning schedule.

How do you intend to publish or disseminate the results?

It is anticipated that the results of this research project will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that the participant cannot be identified, except with your permission.

Will the data and information that I have provided be disposed of?

No. Your data will be used as per Western Sydney University's Open Access Policy. This means that data collected from this study can be made available online and world-wide in perpetuity.

Can I withdraw from the study?

Participation is entirely voluntary and you are not obliged to be involved. If you do participate you can withdraw at any time without giving reason. If you choose not to continue attending our reading course, you can be absent from any classes without notifying anyone.

If you do choose to withdraw, any information that you have supplied will be treated as a part of the collected data. In this case, you will not be able to withdraw any information that you have supplied.

What if I require further information?

Please contact *Huong Le* should you wish to discuss the research further before deciding whether or not to participate.

Huong Le

PhD Candidate of High Degree Research, School of Education, Western Sydney University.

Phone: + 61 406 917 967   + 84 974 310 555

Email: 18581401@student.westernsydney.edu.au

Principal Supervisor:

A/P Chwee Beng Lee

 Director of Higher Degree Research

School of Education, Western Sydney University

P: +61 2 47360719   Email: chwe.lee@westernsyney.edu.au

What if I have a complaint?

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form. The information sheet is for you to keep and the consent form is retained by the researcher/s.

This study has been approved by the Western Sydney University Human Research Ethics Committee. The Approval number is H12893

Appendix 13

Informed Consent Form – Students

Project Title: A Study of the Use of Computational Concept Mapping Situated in Authentic Learning context to Enhance English as a Foreign Language Students' Metacognition in reading comprehension classes

I hereby consent to participate in the above named research project.

I acknowledge that:

•   I have read the participant information sheet (or where appropriate, have had it read to me) and have been given the opportunity to discuss the information and my involvement in the project with the researcher/s

•   The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to:

☐ Participating in a reading course and engage in concept mapping activities

☐ Participate in pre and post-tests on reading comprehension

☐ Participating in an audio-recorded interview

☐ Participating in a pre and post-survey on metacognition.

☐ Writing journal about my learning process and experience with using computational concept mapping

☐ Participating in a survey questionnaire of General Self-efficacy

I consent for my data and information provided to be used in this project and other related projects for an extended period of time.

I understand that my involvement is confidential and that the information gained during the study may be published and stored for other research use but no information about me will be used in any way that reveals my identity.

I understand that my participation in this study will have no effect on my relationship with the researcher/s, and any organisations involved, now or in the future. I understand that I will be unable to withdraw my data and information from this project.

Signed:

Name:

Date:

Return address: *Ms Huong Le, project conductor or Ms Thao Nguyen, Student Coordinator, Faculty of Economics, Hong Duc University. Room 101. Building A2. Hong Duc University Main Campus. 565 Quang Trung Street. Dong Ve Ward. Thanh Hoa City. Vietnam.*

This study has been approved by the Human Research Ethics Committee at Western Sydney University. The ethics reference number is: H12893

What if I have a complaint?

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Appendix 14

Marking guides for the Pre-test on Reading comprehension

1.   B

2.   D

3.   C

4.   A

5.   Because the walls were tall.

       Because the space was narrow (accept different expressions)

6.   The site was close to tourists to prevent further damage (accept different

expressions)

7.   B

8.   C

9.   A

10.   D

11.   Because they were adopted to different families (accept different expressions)

12.   Tamara went to university and found that she looked like another person

(accept different expressions)

Ethical Code of Conduct

REDI Reference: H12893

Risk Rating: Low 2 - HREC

HUMAN RESEARCH ETHICS COMMITTEE

23 October 2018

Doctor Chwee Beng Lee

School of Education

Dear Chwee Beng,

I wish to formally advise you that the Human Research Ethics Committee (HREC) has approved your research proposal

H12893 " A Study of the Use of Computational Concept Mapping Situated in an Authentic Learning Context (CCMAL) in Enhancing English as a Foreign Lnguage (EFL) Students' Metacognition in Reading Comprehension Classes", until 23 October 2021 with the provision of a progress report annually if over 12 months and a final report on completion.

In providing this approval the HREC determined that the proposal meets the requirements of the National Statement on Ethical Conduct in Human Research.

This protocol covers the following researchers:

Chwee Beng Lee, Lynde Tan, Huong Le

Conditions of Approval

1.   A progress report will be due annually on the anniversary of the approval date.

2. A final report will be due at the expiration of the approval period.

3. Any amendments to the project must be approved by the Human Research Ethics Committee prior to being implemented. Amendments must be requested using the HREC Amendment Request Form

4. Any serious or unexpected adverse events on participants must be reported to the Human Research Ethics Committee via the Human Ethics Officer as a matter of priority.

5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the Committee as a matter of priority

6. Consent forms are to be retained within the archives of the School or Research Institute and made available to the Committee upon request.

7. Project specific conditions:

There are no specific conditions applicable.

Please quote the registration number and title as indicated above in the subject line on all future correspondence related to this project. All correspondence should be sent to humanethics@westernsydney.edu.au as this email address is closely monitored.

Yours sincerely

Professor Elizabeth Deane

Presiding Member,

Western Sydney University Human Research Ethics Committee

Appendix 16

I'm Isabel. I work in a coffee shop in the subway. That's my boyfriend. Alex. 26. He's a policeman and he loves his job. He also likes fishing in his free time and we like to go to the Winn Lake on weekends. We are getting married next year, and I am so excited to be his wife. He's so sweet.

And this is my dad. He is turning 65 this year but he doesn't look like 65. He must be a handsome man in his young age. He's retired now but he likes taking part in local community projects to help collect clothes and books for children in need. He always wants them to have good life and good education.

That's Gloria, my stepmother. She looks quite beautiful and elegant. She's a hairdresser and she's a very nice person. She often does my hair for free. I sometimes come and help her in the shop when she gets too busy.

This is my brother. He is a student and he studies chemistry. He is tall and slim but he does not like to go to the gym. He moved out with his girlfriend last year but they visit us quite often.

That's Natalie. My brother's girlfriend. I don't really like her. She thinks she's intelligent but she's not really. She's a university student. She studies French but she can't speak it very well.

British & American English –

the same, but different

British and American people **speak** the same language – English, but with some small differences.

VOCABULARY

Some words are different in American English, **for example** Americans say *zip code*, not *postcode*, *vacation*, not *holiday*, and *cell phone*, not *mobile phone*. Some words have different **meanings**, for example in British English a *purse* is a thing where women have their **money** and credit cards. In American English a *purse* is a woman's bag.

SPELLING

Colour, *favour*, and other words that **end in** -*our* in British English end with -*or* in American English, e.g. *color, favor*. *Centre*, *theatre*, and other words that end in -*tre* in British English end with -*ter* in American English, e.g. *center, theater*.

GRAMMAR

American grammar is very **similar** to British grammar, but with some small differences, especially prepositions. For example, Americans say *See you Friday*, but British people say *See you on Friday*.

PRONUNCIATION

The most important difference between American and British English is pronunciation. American **accents** and British accents are quite different, and when an American starts speaking British people know he or she is American, and **vice versa**.

Music is changing their lives

Inside the concert hall a top orchestra is playing brilliantly. Their young conductor, Gustavo Dudamel, is one of the best in the world. But we are not in New York, London, or Vienna. We are in Caracas, the capital of Venezuela. The orchestra is the Simón Bolívar Youth orchestra, and its conductor and young musicians come from the poorest families in the country. They are a product of *El Sistema* ('the system' in Spanish), a project started in 1975 to save poor children from crime and drug addiction through classical music.

Today more than 270,000 young Venezuelans from the *barrios* (poor areas in Caracas) are learning to play instruments. They practise Beethoven and Brahms instead of learning to steal and shoot. Gisella, aged 11, says 'I am learning the viola because I want to escape from the *barrio*. In Venezuela now it's cooler to like Strauss than salsa.' Edgar, 22, who plays in the orchestra, says 'sometimes when we finish late I stay in town – it's dangerous to go home at that time. But now most of my friends are here. We are a family as well as an orchestra.'

Dudamel is now also the Musical Director of the Los Angeles Philharmonic, one of the USA's top orchestras. But he returns frequently to Caracas to conduct. 'I miss my orchestra, but I will never leave them. They're family,' he says.

Ecuador

Vilcabamba, a small village in the Andes, is often called 'the Valley of Long Life'. What's its secret? Firstly, Vilcabamba is not very hot or very cold – the temperature is usually between 18 and 27 degrees, and the air is very clean. Secondly, people work hard in the fields, and do a lot of exercise. Thirdly, their diet is very healthy – they eat a lot of fruit and vegetables, and they hardly ever eat meat or fish. The water they drink, from the river in Vilcabamba, is very rich in minerals. They also have a good social life. In Vilcabamba people say, 'The left leg and the right leg help you to be healthy, because they take you to your friends' homes.'

Italy

In Ogliastra, a mountain region of Sardinia, one out of every 200 people lives to be 100, and they are normally very healthy, too. Most of the people in the villages work outside in their fields and with their animals. They have a healthy diet, with a lot of vegetables and not much meat or fish. They hardly ever take any medicine, but they usually drink a little *grappa* before they go to bed. 'Life is hard,' says Fortunato, who is a shepherd, 'but I am never stressed. I never read the newspaper – because I can't read very well.'

Japan

People in Okinawa in Japan do not have big meals. They usually just have vegetables and fish, and often eat soya. Okinawans are very active, and they often work until they are 80 or more. But they also relax every day – they see friends and they meditate. Ushi, from Okinawa, is 107. In the evening she often dances with her daughter and has a glass of *sake*. 'I want to have a boyfriend,' she says. When journalists ask people from Okinawa 'What is your secret?' they answer, 'We are happy, we are always positive, and we are never in a hurry.'

ENGLAND GOSFORTH HALL INN

Gosforth Hall is a small hotel in Cumbria in the north of England, built in 1658. People say the hotel has the ghost of a Catholic priest. He usually appears in Room 11. There is a secret tunnel that goes from behind the fireplace in the hotel lounge to Room 11. In 17th-century England, Catholic priests used the tunnel to hide from Protestants.

The owner of the hotel, Rod Davies, says: 'I didn't believe in ghosts before I came here, but strange things happen in the hotel. One guest woke up in the middle of the night and saw a tall man standing next to his bed. He checked out the next morning.' Rod's wife says: 'One night a lot of books fell off a shelf in the lounge. And sometimes when I am working I feel that someone is watching me, but when I turn round nobody is there.'

GHOST HUNTERS: Ask for Room 11   **www.gosforthhallhotel.co.uk**

SCOTLAND COMLONGON CASTLE

Comlongon is a 15th-century castle in a small village near Dumfries in south-west Scotland. The castle is haunted by the Green Lady, the ghost of Lady Marion Carruthers. Lady Marion was unhappy because she was married to a man she did not love, and in 1570 she jumped from the castle walls and killed herself. Many strange things happen in the hotel – doors open and close, and lights go on and off in empty rooms. An American couple once opened the door of their room and saw a young woman sitting on the bed. They left because they thought they were in the wrong room. In fact it was their room, but when they came back the room was empty.

GHOST HUNTERS: Ask for The Carruthers suite.   **www.comlongon.com**

Dublin – *the friendly city*

People don't usually think of capital cities as friendly, but people told me that Dublin is the exception, so I went there to see if it was true – and it was! Local people greet you like an old friend, they want to know everything about you, and about your day. The tourist guides are really friendly; for example, at the Guinness factory (somewhere you must go) they offer you a free glass of Guinness. The bus drivers on the tour buses (an excellent way to get around Dublin) tell very interesting and amusing stories about all the buildings and monuments they go past. They stop at all the main tourist attractions, for example Phoenix Park, the home to Dublin's zoo, St Patrick's Cathedral, and the main shopping areas (Grafton Street and O'Connell Street). When you want something to eat, the Temple Bar area is the place to go. Even in the restaurants Irish people want you to be happy. They often sit you at tables with other people, and the waiters tell jokes when they serve the food to make you laugh. In general, the food is great and very good value for money, there are lots of things to see, and hotels are cheap – how can you not be happy and friendly with all that?

Nick McCarthy Coventry Telegraph October 26 2010

What I ate yesterday

Laura Bailey *model*

Breakfast I never miss breakfast! I had some cereal and fruit, and a piece of toast. I'm a bit unusual because I have tea and coffee in the morning. I don't mind in which order, but I need to have both.

Lunch I was at my studio all day, so I got takeaway vegetarian sushi from a restaurant called *Itsu*. I became a vegetarian 20 years ago and now I can't imagine living any other way.

Dinner I picked up my children from school and we had a snack – cheese and biscuits. In the evening I went to my favourite pizzeria, and I had a vegetarian pasta dish, and two glasses of white wine.

James deGale *boxer*

Breakfast I woke up and went running for an hour and a half, then I came home and had a cup of tea and some porridge. Then I went to the gym and trained.

Lunch I had a bowl of pasta with chorizo and bacon in tomato sauce with cheese on top, and an apple and an orange. I have an important fight soon, so my diet has to be very strict now. Three meals a day, and no snacks.

Dinner I had a grilled chicken breast and vegetables – mushrooms, sweetcorn and tomatoes. My mum made it – she's a fantastic cook.

Lionel Shriver *writer*

Breakfast I had an enormous cup of espresso coffee with some milk and a little cream. It's all that I need and gives me energy for the whole day.

Lunch I don't eat lunch. I don't understand people who can eat three meals a day. How do they find the time to do anything else?

Dinner First I had a glass of sherry and a bowl of popcorn. Then I had grilled fish with some brown rice and vegetables – peppers and onions. For dessert I had a piece of chocolate cake. I drank red wine.