

**THE EFFECTS OF BRAIN-COMPATIBLE ACTIVITIES
ON RETENTION OF TOURISM ENGLISH
VOCABULARY**

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the Degree of Master of Arts in English Language Studies**

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ผลของการใช้กิจกรรมที่สัมพันธ์กับการเรียนรู้ของสมองสำหรับการจดจำ
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THE EFFECTS OF BRAIN-COMPATIBLE ACTIVITIES ON RETENTION OF TOURISM ENGLISH VOCABULARY

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วัตถุประสงค์ของการศึกษานี้คือ การสำรวจผลของกิจกรรมการเรียนรู้ที่สอดคล้องกับการทำงานของสมอง (Brain-Compatible Activities - BCA) ในด้านความรู้และการจดจำคำศัพท์ของนักศึกษาระดับปริญญาตรีปีที่ 3 จำนวน 31 คนที่เรียนวิชาภาษาอังกฤษเพื่อการท่องเที่ยวในภาคตะวันออกเฉียงเหนือของประเทศไทย อีกวัตถุประสงค์หนึ่งของการศึกษานี้ก็คือ เพื่อค้นหาว่าพฤติกรรมการเรียนรู้ของนักเรียนนั้นจะเปลี่ยนแปลงหลังจากได้เรียนหลักสูตรนี้โดยใช้ทฤษฎี BCA หรือไม่

การศึกษานี้ใช้ระเบียบวิธีวิจัยเชิงปริมาณและคุณภาพ มีการเปรียบเทียบการทดสอบก่อนการเรียนและหลังการเรียนทันทีเพื่อศึกษาเกี่ยวกับความรู้ด้านคำศัพท์ของนักศึกษา โดยได้มีการดำเนินการทดสอบหลังการเรียนทันทีหนึ่งครั้ง และหลังการเรียนไปแล้วระยะหนึ่งสองครั้งอย่างต่อเนื่องเพื่อเปรียบเทียบและค้นหาขอบเขตการจดจำคำศัพท์ของนักศึกษา นอกจากวิธีทดสอบเชิงปริมาณแล้ว ยังมีการสังเกตการณ์ การตรวจสอบบันทึกประจำวันของนักศึกษา และการสัมภาษณ์ถึงโครงสร้าง

ผลลัพธ์ของการศึกษาแสดงว่า นักเรียนได้เรียนรู้คำศัพท์เพิ่มขึ้นอย่างมีนัยสำคัญในระหว่างการเรียนหลักสูตรการท่องเที่ยวโดยใช้ทฤษฎี BCA นอกจากนั้น ยังพบว่า หลังจากเรียนด้วยวิธีดังกล่าวแล้วสามสัปดาห์วัน นักเรียนยังสามารถจดจำคำศัพท์ส่วนใหญ่ที่ได้เรียนมาได้อยู่ พฤติกรรมการเรียนของนักศึกษาเปลี่ยนแปลงไปในทางบวกทั้งในระหว่างการดำเนินการศึกษาและภายหลังการดำเนินการศึกษานี้

สาขาวิชาภาษาอังกฤษ

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LILIBETH TORRES LAGO : THE EFFECTS OF BRAIN-COMPATIBLE
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THESIS ADVISOR : SIRINTHORN SEEPHO, Ph.D., 137 PP.

THE BRAIN-COMPATIBLE ACTIVITIES FOR VOCABULARY RETENTION

The purpose of this study was to investigate the effects of Brain Compatible Activities (BCA) on the vocabulary knowledge and retention of the 31 3rd year undergraduate students taking English for Tourism in the Northeast of Thailand. Another aim was to find out whether the learning behaviors of the students would change after taking the course using the BCA.

Both quantitative and qualitative methods were applied for this study. The pre-test and immediate post-test were compared to see the vocabulary knowledge gained by the students. Consecutively, the immediate post-test and two delayed post-tests were compared to find out the extent of vocabulary retention of the students. In addition to the quantitative measures done in this study, the observation was conducted, students' diaries were examined, and a semi-structured interview was carried out.

The results of the study indicated that the students significantly learned the vocabulary while taking the tourism course using the BCA. Moreover, most of the words that they learned were retained thirty-five days after taking the course. The students' behaviors showed positive changes during and after undergoing this study.

School of English

Student's Signature _____

Academic Year 2010

Advisor's Signature _____

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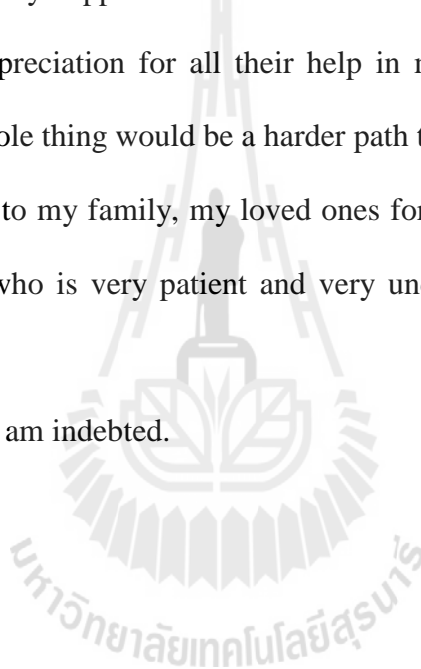


TABLE OF CONTENTS

	Page
ABSTRACT (THAI)	I
ABSTRACT (ENGLISH)	II
ACKNOWLEDGMENT	III
TABLE OF CONTENTS	V
LIST OF TABLES	X
LIST OF FIGURES	XI
CHAPTER	
1. INTRODUCTION	1
1.1 Background of the Study.....	1
1.2 Rationale of the Study	4
1.3 Purposes of the Study.....	7
1.4 Research Questions	8
1.5 Significance of the Study.....	8
1.6 Scope of the Study.....	8
1.7 Definition of Terms.....	9
1.8 Summary.....	10
2. REVIEW OF RELATED LITERATURE	12
2.1 Vocabulary and Its Importance.....	12
2.2 The Brain.....	13

TABLE OF CONTENTS (Continued)

	Page
2.2.1 Basic Parts and Functions.....	14
2.2.2 The Brain and Learning.....	17
2.3 Memory and learning.....	23
2.3.1 Types of Memory.....	23
2.3.1.1 Sensory Memory.....	24
2.3.1.2 Short-term Memory.....	25
2.3.1.3 Long-term Memory.....	25
2.3.2 How Memories are Formed in the Brain.....	26
2.3.3 Processes of Memory.....	26
2.4 Memory and Retrieval.....	27
2.5 Memory and Vocabulary Retention.....	27
2.5.1 Strategies for Vocabulary Retention.....	28
2.5.1.1 Grouping or chunking.....	28
2.5.1.2 Repetition.....	28
2.5.1.3 Word Association.....	29
2.6 Research Result on Brain Learning.....	29
2.7 Brain-Compatible Activities for Vocabulary Learning and Retention	31
2.8 Summary.....	32
3. RESEARCH METHODOLOGY.....	33
3.1 Design of the Study.....	33

TABLE OF CONTENTS (Continued)

	Page
3.2 Participants.....	35
3.3 Variables.....	36
3.4 Instruments.....	36
3.4.1 Pre-test.....	36
3.4.2 Immediate Post-test and Delayed Post-tests.....	37
3.4.3 Word List.....	38
3.4.4 BCA Lesson Plan.....	40
3.4.5 Observation.....	41
3.4.6 Students' Diaries.....	41
3.4.7 Interview.....	42
3.5 Pilot Study.....	43
3.5.1 Participants.....	43
3.5.2 Research Instruments.....	43
3.5.2.1 Pre-test.....	43
3.5.2.2 Lesson Plan.....	44
3.5.2.3 Observation.....	44
3.5.3 Data Collection.....	44
3.5.4 Data Analysis.....	45
3.5.4.1 Pre-test.....	45
3.5.4.2 Lesson Plan.....	48
3.5.4.3 Observation.....	48

TABLE OF CONTENTS (Continued)

	Page
3.5.5 Results and Findings.....	49
3.5.5.1 Pre-test.....	49
3.5.5.2 Lesson Plan.....	49
3.6 Data Collection and Analysis.....	50
3.6.1 Pre-test.....	50
3.6.2 Immediate Post-test and Delayed Post-tests.....	50
3.6.3 Observation.....	51
3.6.4 Students' Diaries.....	51
3.6.5 Interview.....	51
3.7 Summary.....	53
4. RESULTS OF THE STUDY.....	54
4.1 Results.....	55
4.1.1 Research Questions (RQ) 1: Is there any significant difference between the students' vocabulary knowledge and retention before and after attending the instruction through using BCA?.....	55
4.1.2 Research Question (RQ) 2: Do Brain-Compatible Activities affect the students' learning behaviors in class? If so, how?... ..	62
4.1.2.1 The students' learning atmosphere.....	68
4.1.2.2 The student-student interaction.....	76

TABLE OF CONTENTS (Continued)

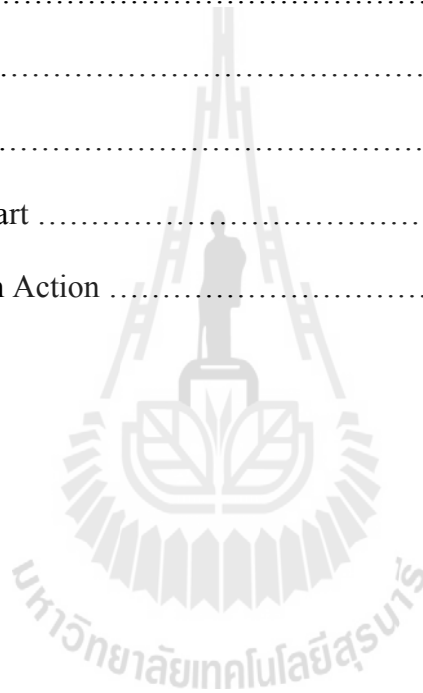
	Page
4.1.2.3 The teacher-student interaction.....	84
4.1.3 Research Question (RQ) 3: What are the students’ reactions to BCA in learning vocabulary?	89
4.2 Summary.....	93
5. DISCUSSIONS AND RECOMMENDATIONS.....	94
5.1 Major Findings of the Study.....	94
5.1.1 Vocabulary Learning and Retention.....	95
5.1.2 The effects of BCA to the students’ behaviors.....	98
5.1.2.1 The students’ learning atmosphere	101
5.1.2.2 The student-student interaction.....	104
5.1.2.3 The teacher-student interaction.....	105
5.1.3 Reactions of the Teacher and Students to BCA.....	105
5.2 Relating findings to similar Studies.....	109
5.3 Pedagogical Implications.....	110
5.4 Limitations of the Study.....	111
5.5 Suggestions for Further Research	112
5.6 Conclusion.....	112
REFERENCES.....	114
APPENDICES.....	119
CURRICULUM VITAE.....	137

LIST OF TABLES

Table	Page
3.1 Result of the test item analysis	45
3.2 Data Collection Time Frame	50
3.3 Research Plan Table	52
4.1 Results of the students' pre-test and immediate post-test	56
4.2 Individual results of the students' pre-test and immediate post-test	57
4.3 Results of the students' retention tests	59
4.4 Individual results of the students' retention tests	60
5.1 The scores of each word used in BCA sessions	95

LIST OF FIGURES

Figures	Page
2.1 The Lobes of the Brain.....	15
2.2 Neuron	16
2.3 Glial Cell	17
2.4 Types of Memory	24
3.1 Research Flow Chart	35
5.1 BCA – Learning in Action	108



CHAPTER 1

INTRODUCTION

This chapter deals with the introduction to the study concerning the effects of brain-compatible activities for teaching English for Tourism taught at the university level. It covers the background, purposes, research questions, significance, and limitations of the study. Definitions of key terms are provided at the end of the chapter.

1.1 Background

With the booming of the tourism industry in Thailand, many schools embarked on incorporating an English for Tourism program into the curriculum in order to initially train the students in this field and prepare them for a rigorous job. For students to become effective tour guides, it is necessary that teachers provide the right classroom environment to support them and thus encourage them to learn actively.

In Buriram Rajabhat University (BRU), English for Tourism is becoming one of the more popular courses, since there are currently many students who are interested in studying tourism. However, teaching this course is challenging to the instructors as the content includes several terminologies which are difficult to remember since they are not used regularly. Examples are words like sanctuary, lentil and pediment which are not generally used in our everyday life but are very important

for tour guides to learn, especially those who are in the Northeastern Region of Thailand. Knowing these words can possibly be a key to increase the number of tourists that would come and visit the place since foreigners would be able to understand its importance and significance better when the information are properly communicated. However, it is very often that the new words met in class are accepted passively since they do not leave a lasting impression on the students, who do not understand them. Passing the course is the usual drive that makes them learn and not the idea of learning something. Valuing the things that they learn in class seems to be the last thing in their minds especially when the teacher uses a lecture style of teaching where students listen and take notes while the teacher gives them information.

The researcher sees the importance of activities in class that would lead the students to find meaning in what they are learning. That will be materialized with the help of the principles of brain-based learning. Students need to know that the things they learn in class are very useful in their life in general. Moreover, they need to see such importance naturally and find its connection in their life to acquire felt meaning on the things they are studying and make those lessons personally relevant. Felt meaning is the feeling that the things we are learning make sense (Caine and Caine, 1994). It is the drive that leads us to learn meaningfully.

The words that the students are learning in English for Tourism course are necessary in order for them to become effective tour guides and be able to communicate well with tourists, either local or international. Students are expected to learn and retain the vocabulary needed for their chosen field. They should be able to

internalize the important words to be able to provide the right information to the tourists in varied situations.

To create meaning in learning the vocabulary for the abovementioned course, the researcher explores the principles of brain-based learning and develops activities for the students' language development and vocabulary learning. These activities aim at creating favorable learning context which results in vocabulary learning and retention for the students' future job as tour guides.

Brain-based learning is about the brain's functions and structures. Every human being has a brain and is thus capable of learning (Hart, 1999). However, if the learning situation hampers the person's opportunity to learn, it would be difficult for any learner to register the things that are supposed to be crucial for them. It is certainly appropriate for every learner to be able to express themselves in the best way they can without fearing of being criticized, judged or mocked. It is also relevant for teachers to energize the learners' brain to keep them growing and developing more vocabulary. Brain-based learning is focused on the reality that everybody learns and that the brain has an immense power to process that learning. It helps provide the opportunity for students to enhance their learning capability. By energizing the brain through activities in the classroom to make it expand its capacity to retain knowledge, it helps the learner reach a maximum potential about the subject matter. Integrating brain-based principles in the English for Tourism lessons is fascinating since this course requires hands-on experiences which can activate the brain and thus helps it to engage with the task at hand.

1.2 Rationale

Tourism is a major source of income in Thailand and it is very important to train students to be efficient tour guides and become ambassadors of the country. However, finding an effective way of teaching and training is necessary. In this study, brain based learning principles are seriously taken into consideration to help the students learn the words needed in their field in a natural way. These principles are their gateway in achieving the desired outcome in becoming productive tour guides.

The brain itself has been the subject of centuries of study. Neuroscientists, psychologists, and educators all played a part in the growing amount of research done in this field. These research studies provided a wealth of resources (Willis, 2008) on brain activity and how it learns (Jensen, 2000, 2005; Caine and Caine, 1994; Sprenger, 1999, Sousa, 2001). The brain-compatible classroom activities are one of the results of the studies made about the brain and its ability to learn. These activities have been carefully planned and are considered very helpful for the language learning development of the students.

Caine and Caine (1994:69) attest that “learning is positively affected by relaxation and challenge and inhibited by perceived threat and fatigue. Stress is considered harmful in learning”. Agreeably, a pleasant atmosphere should be experienced in the classroom where the students learn so that they will be free from inhibitions and be able to express themselves well. Sprenger (1999) notes that there is a great need for students to participate in a realistic environment where they can try new things in an unthreatening way, like practicing to deal with people who are involved in tourism industry for example. Merely showing something to the students is not enough. It is important for them to do hands-on learning as they connect the

past information to the current knowledge they gain and be able to retain them for future use (Wolfe, 2001, Caine and Caine, 1994).

As students learn in a sensible and meaningful way, the information learned is retained in their memory bank (Sousa, 2001, Sprenger, 1999). That means, when teaching the students, the teacher should associate the words with something concrete like real life situations or real objects to provide meaning in remembering since the human brain is both visual and textual and can remember better when the words are aided with objects (Paivio and Csapo, 1973). As a facilitator of the students' learning in the classroom, the teacher's challenge is in choosing the right activities and materials to develop retention among the students. Such activities should help the students keep the information and knowledge they have learned in class and transfer this knowledge from their short-term to their long term memory, thus, enabling them to draw such knowledge from their brain whenever the situation calls for it.

Memory, either short-term or long-term, is essentially about the brain. The students' ability to store information and recall it later can certainly affect their performance in learning. Jensen (2005:125) asserts that the "only way we know that students have learned something is if they demonstrate recall of it". Matured and independent students can connect past experiences with the present which eventually lead to better understanding of the task at hand (Caine and Caine, 1994; Sprenger, 2005). Still, in vocabulary learning, many students tend to remember the words that they use very often, eventually forgetting those words that are used infrequently. However, if they understand the importance of the new words presented to them to learn and the words' impact to their future career, they could refocus and internalize the new knowledge they are gaining while taking English for Tourism.

Brain-compatible activities (BCA) can be the key to help students remember the things they have learned in the classroom for a longer period of time. As information is repeated a number of times, the students' long-term memory will be able to store the vocabulary words and retrieve them when needed. Although retrieving is not a very easy process, it is still believed to work well under certain conditions where the brain is at ease (Caine and Caine, 1994; Sousa, 2001). Sprenger (2005) offers seven steps of learning for memory retention. These are: reach, reflect, recode, reinforce, rehearse, review, and retrieve. In her book, "How to teach so Students Remember", she explained that teachers first need to reach for the students in order to teach them. Next is allowing the students the time to reflect so they could create a connection between the past knowledge and the present information. Recoding is letting the students process the information and make them their own, which is reinforced by the teacher's approval or comments. Rehearsal and review are the activities in class which help make the information sink deeply into the memory of the students allowing it to linger for a longer time. Information retrieval can be in a form of tests or series of tests (Baddeley, Hitch, and Allen, 2009) which can be done in "increasingly longer intervals" (Sokmen, 1997) to evaluate the long-term storage of the students' learning regarding such information.

Though many people think that brain development is only for children, several studies have been found proving that it is a lifetime growing matter. Concurring with Caine and Caine's (1997:2) brain learning principles that "learning is developmental", these researchers (Tompkins, 2007; Lin, 2010; Chang, 2004; Bayindir, 2003) have proven that the brain continues to work wonderfully even when the person is already beyond the so-called critical period. No matter how old a person is, learning

continues to occur. This challenges the researcher to find out whether the initial use of BCA will be effective in the vocabulary learning and retention of the undergraduate students who are taking the Tourism course. With that, this research is focused on the area of vocabulary learning, since words are essential in developing fluency in language development. This poses a challenge to the researcher as to the extent of the learning that the students would gain especially on the retention of words and on recalling them after a period of time.

1.3 Purposes of the study

This study aims to investigate how brain-compatible activities (BCA) will affect the learning of the third year students in the English for Tourism class at BRU.

The purposes of this study are as follows:

- to investigate the effectiveness of BCA as an approach in vocabulary learning and retention
- to look at the changes in students' learning behaviors in class as BCA is employed in their English for Tourism course
- to see how the students react to BCA as a tool in vocabulary retention and recall

1.4 Research questions

In order to achieve the purpose of this study, three research questions are formulated as follows:

1.4.1 Is there any significant difference between the students' vocabulary knowledge and retention before and after attending the instruction through using BCA?

1.4.2 Do brain-compatible activities (BCA) affect the students' learning behaviors in class? If so, how?

1.4.3 What are the students' reactions to BCA in learning vocabulary?

1.5 Significance of the study

This study can be practically and theoretically important to the educational curriculum in Thailand since English language teaching has now been given special attention and is now a major part of the curriculum. The issue addressed in this study can be useful to the instructors and students alike, especially the instructors who are concerned with selecting useful techniques and principles for designing a more effective course of study by drawing from available techniques and existing research findings.

1.6 Scope of the study

The scope of this study focused on the third year students at BRU taking English for Tourism as part of their curriculum. These students learned the key terms which were important for the field of work as tourist guides. The course lessons were

focused on the tour sites at Buriram province since the students were already familiar with the places and learning more was advantageous for them.

This study aimed for the students' vocabulary retention. It covered a 10-hour instruction of the course, two-and-a-half hours per session using BCA after which the students' vocabulary knowledge was immediately tested. Two weeks after the end of the lesson, the students' retention was tested using the same test given in the post-test. Three weeks later, the same test was given to the students to check if they could still remember the words they learned in class or not anymore.

1.7 Definition of terms

The following terms are used in this study:

1.7.1 Buriram Rajabhat University (BRU)

Buriram Rajabhat University refers to the state university in Buriram province, Northeast of Thailand. It offers English classes in the Faculty of Humanities and Social Sciences. This is the university where the researcher will conduct the study with the students studying in this same school.

1.7.2 Brain-compatible activities (BCA)

Brain-compatible activities are the planned course activities to enrich the vocabulary learning and retention of the third year English for Tourism students at BRU. These activities are designed based on the principles and theories of brain-based learning by Caine and Caine (1994).

1.7.3 English for Tourism (ET)

English for Tourism refers to the course content being focused on in this study. The course aims at developing knowledge and skills among the students in the

tourism world. It focuses on learning about the tourist attractions in the local area and being able to tell the appropriate information to the tourists who come to visit the places. Students should be able to conduct tours and guide international or local tourists after taking the course.

1.7.4 Learning behaviors

Learning behaviors refer to the attitude of the students towards learning in the English for Tourism course. These would focus on the students' participation and interaction among each other and with the teacher in class while taking the course. These would include the students' manifestations of the given activities and the understanding among the peers in every grouping during the instruction.

1.7.5 Vocabulary retention

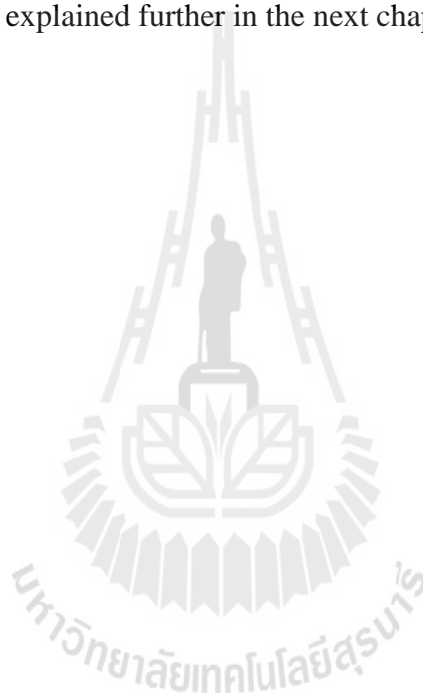
Vocabulary retention refers to the extent of remembering the words taught in the English for Tourism class. Retention will be tested simultaneously after the students have finished with the instruction.

1.8 Summary

The researcher conducts this study in the Northeast of Thailand to cater to the economic trend of tourism in the Kingdom and the ongoing popular demand for the course among the students in Buriram Rajabhat University. This study focuses on the retention of the words that the students learn in class and will use in the tourism world as tour guides, aided with the activities to help them in this study. Brain-compatible activities are used to enhance retention among the students. These activities are based on the brain-based principles by Caine and Caine (1994) which theories are incorporated in the lessons created by the researcher. There are seven steps in learning

suggested by Sprenger (2005) which could enhance the memory retention of the students alongside with the brain-compatible activities.

The next chapter of this study deals with the literature review that would explain more about the importance of vocabulary in learning a language, the brain parts and functions, and the strategies that the researcher believes to be useful in teaching and learning English for Tourism. The brain-based principles used by the researcher will also be explained further in the next chapter.



CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter is about the review of the literature related to this study. It is composed of vocabulary learning and its importance in second or foreign language acquisition, the brain and its relationship to teaching and learning, memory and retention, research in this field, and brain-compatible activities for vocabulary learning and retention.

2.1 Vocabulary learning and its importance

It is very important to learn vocabulary when learning a foreign language since vocabulary plays a major role in language comprehension and production (Read, 2000). It is “central to language and of critical importance to the typical language learner” (Zimmerman, 1997:5). Educators are faced with the challenge of how to teach vocabulary to learners comprehensively making them able to recall the words they learned when the situation calls for it (Sokmen, 1997). It is certainly not possible for any person learning a second or foreign language to be able to convey one’s thoughts and ideas without learning a reasonable amount of vocabulary. The more words a person knows and understands, the better they can communicate meaningfully and the easier it is to understand the language. For students to be proficient and competent EFL (English as a Foreign Language) learners and language

users, they need a large, rich vocabulary and the special ability and skills to use those words adequately (Pikulski and Templeton, 2004).

Nation (2001) believes that a large amount of vocabulary can be acquired with the help of vocabulary learning strategies. The skills learned along the way prove useful for students of different language levels. Once the learner gains a wide knowledge of vocabulary, the development of language skills like reading, writing, speaking and listening is inevitable. Fluent target language users usually internalize the use of the language by committing as many words as they can to their memory. The more words they commit to their long term memory, the more confident they become and the easier it is to learn new words. Students employ different strategies to improve their vocabulary (Schmitt, 1997; Nation, 2001). Each strategy is considered helpful in some way.

2.2 The Brain

By utilizing the brain and its faculties, vocabulary learning will no longer become a difficult task for every second language learner. The students' awareness of learning consciously will be enhanced knowing that they are learning for a valuable reason. Yet, one should know the brain first and how it functions in order to use it for optimal learning.

The human brain is a fascinating but complex organ that theorists like Caine and Caine (1994) compare it to a city in which landmarks are connected with wires, while Jensen (2000) compares it to a rain forest jungle with its unique survival ability depending on what influences it. It is an integral organ in our body that allows us to

use our senses, to feel, to think, and even to make decisions (Howard-Jones, 2010). It deals with emotions, learning, movements, and thoughts in every human being.

The brain weighs around three pounds, less than the skin that covers our body. It works as the receiver and giver of information for all the systems in our body. Wolfe (2001:2) defines brain as the source of one's "cognition, memory, thoughts, and intelligence". However, teachers do not need to become psychologists or neuroscientists in order to know how the brain operates. We only need to acknowledge that teaching can become more effective when we know how the brain senses, processes, stores, and retrieves information (Perry, 2005). Hart (1999:xi) states that,

“Education is discovering the brain, and that’s about the best news there could be. Anyone who does not have a thorough, holistic grasp of the brain’s architecture, purposes, and main ways of operating is as far behind the times as an automobile designer without a full understanding of engines”.

Hence, it is impossible to separate the brain and learning. Knowledge of the brain and its functions could only lead to better understanding on how it works that would benefit the teachers and learners at the same time.

2.2.1 Basic Parts and Functions

The brain is responsible for the senses and reflexes in our body. It deals with the thinking process including the things that we store in our memory. It communicates to the different parts of our body through its cells. It changes

throughout an individual's life. These changes are age-related as well as through experiences (Howard-Jones, 2010).

The cerebrum is the largest part of the brain. It is divided into two halves, better known as hemispheres. Each hemisphere is further divided into four lobes or four regions namely: frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

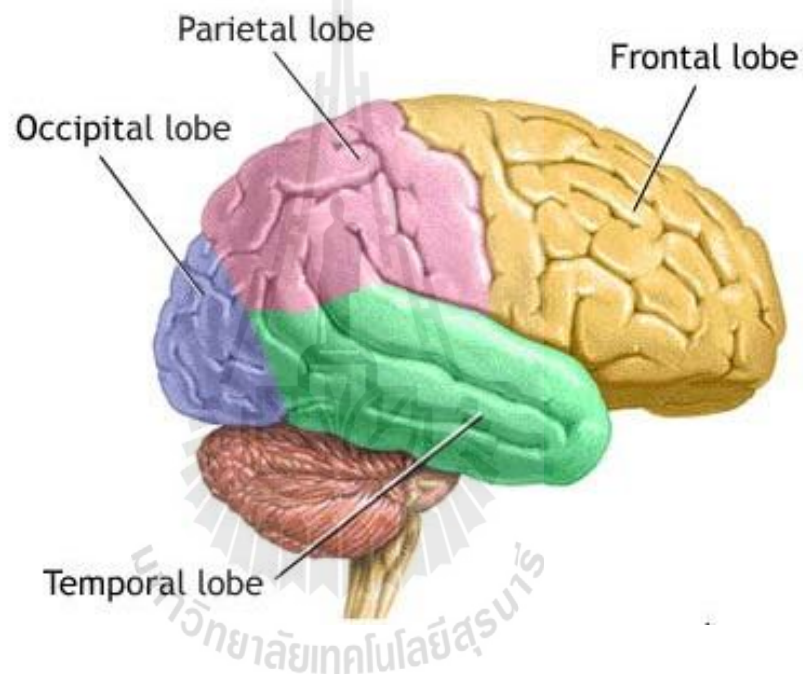


Figure 2.1 The lobes of the brain (Adapted from www.healthguide.howstuffworks.com)

The frontal lobe is found behind the forehead. It governs our voluntary movements, emotions, speech, reasoning, planning, and problem solving. The parietal lobe is right behind the frontal lobe. It processes sensory information like touch, pain, taste, and pleasure. It also concerns with language. The occipital lobe deals with vision and recognition of objects. It is found at the back of the brain. The temporal lobe is near the temples just above the ears and is involved with hearing and memory.

The amygdala is a group of nuclei that sit in the medial temporal lobe. They are shaped like an almond. They process the emotional events of the person, consolidate them and store them in the long-term memory.

Two important cells found in the brain are called neurons and glial cells. These two cells are responsible for learning things and storing information or throwing it away.

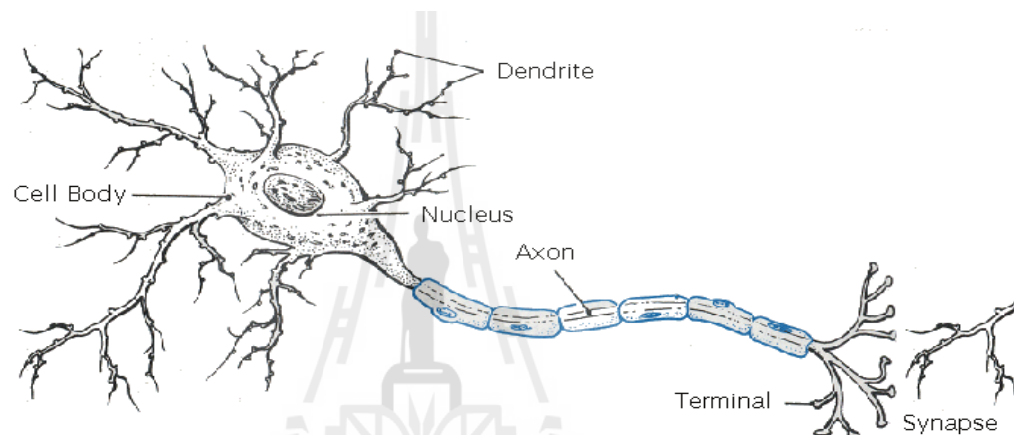


Figure 2.2 Neuron (Adapted from www.jermaineadrianstone.blogspot.com)

Neurons or nerve cells make connections with other neurons as an individual learns. There are about 100 billion neurons in the brain. Learning is simply defined as “two neurons communicating with each other” (Sprenger, 1999:2). Every new experience an individual has changes the brain and causing the neurons to sprout new branches, called dendrites. When a neuron communicates with another neuron, the message goes to the dendrites, moves down to the axon, and moves across the synapse to the dendrite of another neuron. When neurons continuously bond with each other, the connections are easier to make. This helps facilitate remembering and making the students learn a new lesson by connecting it to their past knowledge.

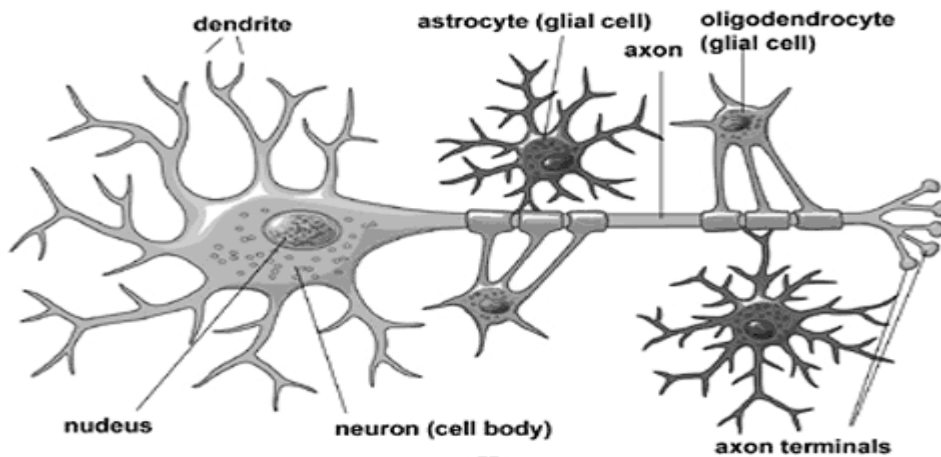


Figure 2.3 Glial Cell (Adapted from www.withfriendship.com)

Glial or “glue” cells feed and nurture the neurons. They keep the neurons in their place and make sure that they are being nourished and well taken care of, keeping them insulated from one another and removing dead neurons. They are nerve cells that do not carry nerve impulses. The brain needs additional number of glial cells as it uses neurons more often.

Another important substance found in the brain is called myelin. It is a fatty substance that coats or covers the axons in neurons. Once our brain has enough myelin, planning for the future, solving problems, and making decisions will then be more sensible and easier since myelin is responsible for the maturation of the thought processes (Howard-Jones, 2010). This developmental process that begins at birth starts from the lower area of the brain to the prefrontal cortex, and is associated with short-term memory.

2.2.2 The Brain and Learning

One of the objectives in learning and teaching is for the students to become critical and develop good judgment as mentioned by John Sculley, former CEO of

Apple Computer during the Consumer Electronic Show in Las Vegas (1992). He further reiterated that we can deeply understand 85 percent of our hands-on experiences and they mostly remain in our long-term memory. Comprehending is necessary for a successful economic stability in the global world as compared to merely understanding the things around us. Once the learners comprehend what they are learning, they could then use such knowledge in their life (Sculley, 1992).

The human brain is basically responsible for all the things we learn in life. However, there are certain things that are focused on how the brain works with environmental influences in order to become more efficient in learning. Educators would find it easy and fun to teach when the students' brains are engaged – that is when all their senses are involved. When students are focused on the things that they are concerned with, they will be able to link the new information to their previous experiences, thus creating more meaning to what they are learning at present. They are believed to respond positively in classroom activities which they could make sense of and where their five senses are working actively. Classrooms that promote brain-compatible teaching and learning allow students to experience challenges. Challenging activities make the students think and be active in class. As they participate in the activities, they would have a feeling that they belong since emotional well-being allows the intellectual capacity of the students to function well (Marchese, 2002). The absence of threat and a state of relaxed alertness (Caine and Caine, 1994) is one of the characteristics of brain compatible learning. The students interact well when they know they are respected and will not be laughed at even when they commit a mistake, thus giving them the courage to participate in class. In this

approach, feedback should be provided immediately in order for the students to know where they are at in terms of learning.

There are twelve principles of learning created by Caine and Caine (1994) as a result of their research and constant study about the brain and how it learns. These principles are considered as the basis in teaching the students by engaging the brain. These are the following:

2.2.2.1 The brain is a parallel processor. It can deal with many things at once like thinking and listening at the same time. The teacher should make use of this characteristic of the brain and provide various learning activities where the brain can interact with other brains to enable learning.

2.2.2.2 Learning engages the entire physiology. The students' experiences affect their learning in a much broader sense. How they are treated and accepted as individuals in the classroom will affect their interaction with the teacher, classmates and the course they are taking. Other physiological necessities, like good health and good rest, also affect the passivity or activeness of the student in class. The brain works well in a non-threatening environment coupled with students' good nutrition and habit. The latter, however, is quite difficult to control. Hence, it is better for the teacher to provide proper activities in class that would encourage the students to become engaged and interested.

2.2.2.3 The search for meaning is innate. It is natural for every human being to look for the sense of what we are doing. Teachers should give more challenging activities to the students that would help them familiarize the things that they are learning.

2.2.2.4 The search for meaning occurs through “patterning”. Learners can learn better if they can create meaning between what they are studying and their personal life. Once they are able to connect the pattern and get the value of what they are doing, the students will then feel free to express themselves and get involved in classroom activities.

2.2.2.5 Emotions are critical to patterning and drive our attention, meaning and memory. Students and the teacher need to maintain a harmonious relationship with respect and acceptance of each other in and out of the classroom. This kind of relationship will affect the learning of the students in a way that they will feel free to express their idea without fear of being criticized or insulted.

2.2.2.6 The brain simultaneously perceives and creates parts and wholes. The brain is divided into right and left hemispheres which interact with each other. While one side reduces information into parts, the other side works with it as a whole.

2.2.2.7 Learning involves both focused attention and peripheral perception. In order for students to be enthusiastic in learning, the teacher should show enthusiasm first of all. This will draw the students’ attention to the learning material and process, where they will see the importance of learning the course. Visual materials should also be provided.

2.2.2.8 Learning involves both conscious and unconscious processes. The teacher needs to provide a connection from the students previous learning to make a connection and create meaning of what they are currently studying. This process prepares the students’ unconsciousness to work favorably, then consciously takes in the new information at hand.

2.2.2.9 We have at least two types of memory: spatial and rote. There are things that we remember without doing anything to process it like remembering the dress that we used yesterday. That is the human's spatial memory which is unlimited and is always at work. Rote memory needs to be practiced and prepared in order to keep them for a long term basis, like repetition.

2.2.2.10 We understand and remember best when facts are embedded in natural, spatial memory. When learning activities are integrated to real-life experiences, learning and retention are enhanced.

2.2.2.11 Learning is enhanced by challenge and inhibited by threat. A good challenging activity can awaken the students' interest as they learn in class and positive emotional experiences enhance long term memory (Jensen, 2000). Still, activities should be chosen carefully so as not to stress the students and lessen their interest.

2.2.2.12 Each brain is unique. Each person has brain but the experiences and the made-up of the whole being is different in every individual. Thus, the teacher should provide varied experiences in the classroom so that the students would become interested in learning.

There are three important phases of the learning and teaching process suggested by Caine and Caine (1994) that are very valuable in developing lessons for the learners. These are: orchestrated immersion, relaxed alertness, and active processing (Caine and Caine, 1994). Each phase is not a separate entity from the others. Each has a distinct role in the teaching and learning process by which students comprehend the lessons in a non-threatening way.

The first phase, orchestrated immersion, deals with the part of learning where students find meaning and make the connection on the things they are learning. This activates the learners' minds and helps them in creating patterns and associations as they learn in a rich and encouraging environment. The second phase, relaxed alertness, is the phase in learning where students are challenged to work on certain activities that will lead to comprehension and retention of the things they are learning. It involves hands-on activities which are fun. Students are challenged with a sense of purpose and with the relaxed feeling, thus being able to express themselves in a manner that they are comfortable with. The third phase, active processing, is a theoretical processing of meaningful experiences resulted from connecting the past knowledge and experiences to the present lessons and making sense of what they are learning. In this phase, students are expected to internalize the information and understand it in order to be able to use it sensibly.

Brain learning leans more on the way the students learn. It centers on the things that the teacher, as a facilitator, needs to do in order to enhance the knowledge of the students in a certain way. It facilitates the usefulness of the brain in storing data and information and recalling them when necessary. When students fail to remember the things they have learned in class, it means that their learning is only skin-depth or that it could have been interfered with. Knowing the storage in our memory and how to facilitate the transfer of learning to attain retention serves as a valuable tool in helping the students make use of the brain faculties to learn and remember what they learned.

2.3 Memory and Learning

The human memory works like a filter, choosing only those pieces of information which are meaningful to an individual and throwing away those which are not relevant (Jensen, 2000, Sprenger, 2005). Once the human brain finds meaning in the things it engaged in (Bransford, et.al., 2000), such experience or information is stored in the memory bank for a long period of time. It is easier to retrieve the information when the situation calls for it if the brain knows the “when, why, what and how of the information” (Bransford, et.al., 2000) it is trying to retrieve.

Meaning is very important in learning and in providing meaningful connection between the past and new knowledge (Sousa, 2001, Caine and Caine, 1994)). Once the teacher in the classroom is able to connect the past experiences of the students to the present ones, and make them relevant in the students’ life, then there is a greater possibility that such lessons will be remembered and will be available for recall in the students’ memory for a long period of time. Although there are many ways to aid the retention of the students’ learning, creating meaning can serve as a passage where students would start interacting and become open to learning. There is a huge impact for students’ improvement in skills and abilities once they are able to connect the things they already learned to a new knowledge and they know the value of what they are doing.

2.3.1 Types of Memory

Three types of memory will be discussed in this study. These are the sensory memory, short term memory, and long term memory.

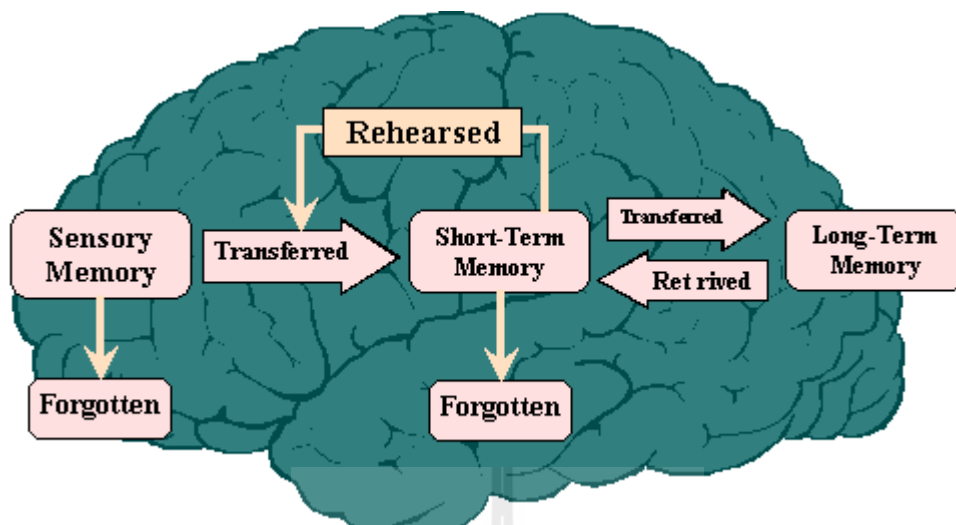


Figure 2.4 Types of Memory (Adapted from www.nwlink.com)

2.3.1.1 Sensory memory

Sensory memory refers to the immediate information that the brain gets from its environment, basically from the human senses to the brain. It is the ability to retain the impression on sensory information after the stimulus has ended. This memory fades very easily. When the information lingers longer, it transfers to the short term memory.

If one has become a witness to a bank robbery, for example, and he notices the robbers' clothes and the small details that happened during that time, such is sensory memory. It may not linger for a longer time, but if the impact on the witness was so strong that he vividly remembers everything, from the color of the robbers' clothes, to their voices, etc. and if the memory retains in ones' mind days after the incident occurred, it now moves to the short-term memory.

2.3.1.2 Short-term memory

Baddeley (1997:49) defines short-term memory as a “system for temporary holding and manipulating information as part of a wide range of essential cognitive tasks such as learning, reasoning and comprehending.” It is also called working memory. It can only hold a little amount of information at one time. As the temporary storage of information to our brain, it mostly stores current information and experiences which can be easily forgotten. There are many strategies available to aid the processing of information stored in the short-term memory and transfer it to the long-term memory so it can be recalled in the future. When students put their attention towards what they are learning and they experience relevant and meaningful classroom activities, such information will likely be stored in the long-term memory (Sousa, 2001).

2.3.1.3 Long-term memory

It is the memory system in which information is stored more or less permanently. This information affects the current situation and how the students perceive the new lessons and new activities in class. Caine and Caine (1994) suggested that meaningfulness is very important in teaching the students so that their brains will fully grasp the desired learning and information.

Oftentimes, classroom teachers connect the new lesson to the students’ past knowledge (Marzano, 2004) stored in their long term memory in order for the new lesson to make sense. Knowledge will be linked together and will be activated when new information comes that is closely related to the memories stored (Baddeley, 1997). This is how relevant knowledge is recalled when similar information is

presented (Sprenger, 2005). Students would consider the new knowledge valuable and relevant since they see the connection from prior experiences as provided.

2.3.2 How memories are formed in the brain

Sousa (2001:84) believes that the “teacher with a greater understanding of the types of memory and how they form can select strategies that are more likely to improve the retention and retrieval of learning”.

As mentioned in 2.3.1.2, learning and remembering things require attention. Once the students lost their attentiveness to the lesson and the activities in the classroom, their learning is in jeopardy and transfer to long-term memory will be impossible, which means that there will be no retention or recall that will happen even when the teacher provides some hints (Sprenger, 2005). To avoid inattentiveness in class, the teacher is encouraged to adapt fun activities and easy to follow instructions. The classroom must be transformed into an environment suitable for learning (Sousa, 2001; Jensen, 2005; Erlauer, 2003) or a relaxed atmosphere (Caine and Caine, 1994) where students are in good “emotional state” (Jensen, 2005:77). Students need to be involved (Jensen, 2005; Sprenger, 2005; Erlauer, 2003)) and teachers need to give reinforcement (Sprenger, 2005) like good comments or positive corrections to encourage the students to keep participating. Threats and other negative feelings need to be avoided to facilitate learning and retention because our brain works well when it is in a relaxed state (Caine and Caine, 1994; Jensen, 2005).

2.3.3 Processes of Memory

There are three processes of memory that could guide teachers in knowing more about the brain and how it learns. These are encoding, storage, and retrieval (Duzel, et. al., 1999). Encoding can be compared to that of the computer where we

type the information to its temporary storage called RAM (Random Access Memory). In the same way, we transform our experiences and the information we learned at that moment by storing them to our memory. Maintenance is keeping the memory alive by keeping a record of the information learned or providing various practices for further comprehension. Resting is also a good way to keep our memory alive. The third process, which is the retrieval, finds the encoded information to be able to use them. There are many ways in which we can retrieve information from our memory bank.

2.4 Memory Retrieval

Retrieving the information from ones' brain is an act of accessing memory from the storage area. It is sometimes very easy, other times it needs extra effort, still other times it is nearly impossible to retrieve the information in our long-term memory (Ormrod, 2003). Regardless of the state the learner is in, the storage of the information and its meaningfulness in one's life, retrieval is usually done in the classroom as a measurement of the students' knowledge facilitated by the teacher. Taking the test is one of the ways in which information is retrieved from the learners' memory bank.

2.5 Memory and vocabulary retention

Recalling things that we have learned long time ago can be a daunting task, yet some people would find it easier especially when the topic is of their interest and something they put more value into. In learning a foreign or second language, remembering words is very necessary since vocabulary is considered a gateway to

communication. It would be impossible for someone to communicate in another language without remembering important words to convey their ideas.

2.5.1 Strategies for vocabulary retention

The activities that we use in class and in teaching our students can help them in storing the information either in their short-term memory or long-term memory depending on the intensity of the learning material or the meaning it gave in their life. It is very important, however, that the teacher provides such activities to enhance the students' retention of the things that they are learning in class. The following are some of the retention-enhancing activities that are useful in the students' learning development.

2.5.1.1 Grouping or chunking

Putting the words in groups is another good way to learn new vocabulary. Grouping the nouns together on one side and verbs on the other, for example, helps the students identify the new word and how it functions. By doing so, they will feel more confident to use the words they have learned as they know what it is and how it's being used.

Example: "View" and "temple" are nouns while "carved" and "restore" are verbs. Students should be able to group them accordingly with the guidance of the teacher during the activities.

2.5.1.2 Repetition

Nation (2001) suggests that repetition of vocabulary is crucial in the students' fluent use of the language. Meeting the words once is not enough for every student to internalize its usage and meaning because there is so much to learn for every word.

Example: Today's lesson includes learning the word "ancient". The teacher will present the word. The students have to use the word in the sentence or dialogue. Before the session ends, students have to use it again in another activity. The word will be reviewed on the next session before the new lesson begins.

2.5.1.3 Word association

Associating words with concrete things is another way of learning new words in class. It will be easier for the brain to commit a new word to memory when it is associated to something concrete. Thus, object association is a valuable tool in enhancing vocabulary.

Example: Take the students to a trip and show them the real lintel or pediment. Explain its relevance to history and in Thai culture to make them more interested.

The three strategies mentioned above will be used in the lessons one way or another to make the students internalize the meaning of the words they are learning and retain them in their memory.

2.6 Research Result on Brain-based Learning

A study on brain-compatible vocabulary teaching strategy for underachieving EFL learners was done by Chang (2004) for the senior high school students in Taiwan. The aim of the study was to explore the effects of brain-compatible vocabulary learning strategies instruction (BVLSI). Six English teachers were interviewed to find out the vocabulary instruction they use in class and one-hundred fifteen eleventh-grade students underwent the instruction. They were divided into two groups: controlled group who are the recipient of BVLSI and experimental who were

taught in a traditional way. The participants took an achievement test after the end of the instruction to find out if they learned the words covered in the teaching program. It was found that brain-based strategy helped the students become more participative and more active in class. It helped create a pleasant atmosphere in the classroom and enriched the materials and content of vocabulary instruction. The researcher on this study concluded that brain-learning can facilitate subjects' word learning and raise their interest in learning English words.

Tompkins (2006) developed a model design of an online course utilizing the theory of brain-based learning by analyzing literature about distance education and the brain learning theory. The model design aimed to help in the transfer of learning across course management system in the higher education. The result created an acronym, IGNITE as the theoretical model of the brain-based distance learning design. IGNITE means; *Intervals*: Provide intervals of intense focus with frequent breaks, *Grouping*: chunk everything possible in groups of 3-5, *Novelty*: use novelty, variety, humor, and frequent change, *Interconnectedness*: connect, engage, experience/demonstrate, revisit, *T²*: *technology* integration; allow *time* for processing with depth and quality, *Environment*: demonstrate the value of affective atmosphere in teaching/learning (Tompkins, 2006). It is the researcher's belief that this model design that was developed as a result of this study would maximize learning in higher education.

Lin (2010) conducted an action research investigating the outcome of combining the whole language approach (WLA) and brain-based learning (BBL) in a GEPT (General English Proficiency Test) preparatory course on the test performance of 15 junior high school students. The researcher used qualitative methods in collecting the data from questionnaires, classroom observations, interview, and the

participants' reflections. The findings showed that the students developed a high interest in learning English using WLA and BBL instructions. Their comprehension of the language had increased. The students' reactions to the activities done in class were remarkable, yet there was no significant difference in the students' GEPT performance due to stress and the changes done in the listening part of the test. In conclusion to the study, the researcher suggested that there are many ways to get an optimum result in using WLA and BBL like making sure that reading, writing, speaking, and listening are taught in class and establishing brain learning in order to develop the students' confidence in order to do better during classes and tests. The activities should be appealing and could stimulate retention among the students. Finally, in order to facilitate learning, a student-centered classroom should be developed where students would find meaning in what they're learning and the effects would be better.

2.7 Brain-Compatible Activities for Vocabulary Learning and Retention

The brain-compatible activities were developed based on the principles of brain-based learning by Caine and Caine (1994). These principles were considered when creating the lesson plan for this course to ensure that brain activities are involved in learning. Each principle connected to this study is explained in 2.2.2. The activities were centered on the vocabulary learning of the students which would lead to retention as they focused their attention to what they were learning. In class, BCA would start with getting the attention of the students to letting them feel the importance of what they were doing.

2.8 Summary

Vocabulary learning is one of the keys that unlocks foreign or second language learning and helps the learners to be proficient. In developing the students' vocabulary, the brain is considered to be responsible with the teacher's proper guidance and promptings. Teachers are encouraged to take a look at the brain, its parts, functions and its connection to learning. Researchers and educators joined hands in trying to prove that the brain is very important especially in retaining information learned in class. Three kinds of memory are included in this study: sensory, short-term, and long-term memories. The information that we learned is stored in our short-term memory, and when considered valuable, will be transferred to the long-term memory and will remain there for as long as it takes, sometimes a lifetime.

Caine and Caine (1994) are the two researchers in the education field who created the principles for brain learning. These principles are considered very important in creating activities for the students to activate the brain and store information to our memory system. Three strategies for vocabulary learning and retention are included in this study: grouping, repetition, and word association. These strategies can help the students understand the new words they encounter in class and make those words ready for recall when needed.

In the next chapter of this paper, the research designs will be dealt with. The instruments used for collecting the data and how to analyze them will be explained in detail. The participants for this study will also be described with the reasons why they were chosen to gather the data from.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the methodology used for this research. It includes the design of the study, participants, research variables, instruments used in collecting data, data collection, and data analysis methods. The methodology used in this research aims to shed light on the following questions:

1. Are there any effects on the students' vocabulary knowledge and retention before and after attending the instruction with BCA?
2. Do brain-compatible activities (BCA) affect the students' learning behaviors in class? If so, how?
3. What are the students' reactions to BCA in learning vocabulary?

3.1 Design of the Study

Both qualitative and quantitative research methods were used in this study. It involved vocabulary pre-test, post-test and two delayed post-tests, a list of words to be used for teaching and memory retention testing, designed lessons based on brain-based principles or Brain-compatible Activities (BCA) as a teaching tool to enhance vocabulary learning and retention, an observation on students' learning behaviors in the classroom, students' diary and an interview.

The students were taught using the BCA which covered ten-hours of instruction consisting four sessions that covered two-and-a-half hours per session.

This ended with an immediate post-test followed by a delayed post-test after two weeks and another delayed post-test three weeks later. The two delayed post-tests were given to strengthen the result of the vocabulary knowledge and retention of the students. The instruction was focused on the technical vocabulary used in the English for Tourism course particularly in Phanom Rung Sanctuary, Northeast of Thailand. The data obtained was analyzed both quantitatively and qualitatively. The quantitative data helped the researcher in finding out whether BCA was effective for the students' vocabulary retention in English for Tourism and if they were able to recall the words after the intervals while the qualitative data was utilized to see how BCA affected the students' learning behaviors and how the students reacted to the given activities which were focused on energizing their brain.

Diary writing, observation and interviews were used to gather the data which were analyzed qualitatively. For the mentioned data tools, the participants were assigned according to their scores in the pre-test prior to the BCA instruction. The post-test was given after the BCA instruction which was followed by two delayed post-tests. The result of the pre-test was used to determine the five highest scores and the five lowest scores of the students. They were asked to write diaries, were closely observed and were interviewed for this research. The pre-test also helped the researcher identify the words which the students had difficulty with and used them in the lessons and in creating the post-tests. The results of the post-test and the two delayed post-tests were analyzed quantitatively by comparing the means of the participants in each test.

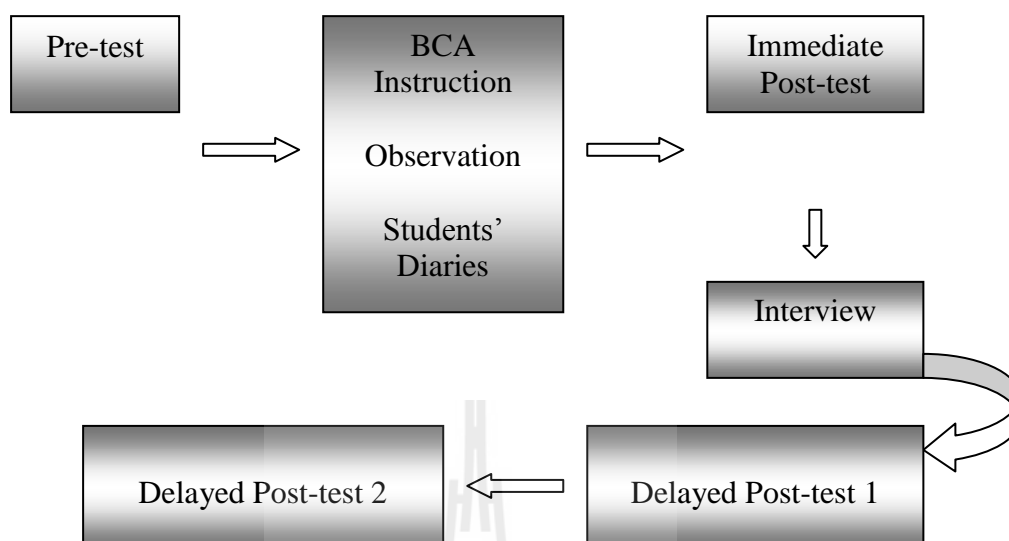


Figure 3.1 Research Flow Chart

3.2 Participants

This research investigated the effectiveness of the brain-compatible activities in vocabulary retention of the third year English for Tourism (ET) students at Buriram Rajabhat University (BRU). The target population for this study was 31 BRU students who were enrolled in term-1, academic year 2010. Their average age was 19 years old. They were studying in the English Language Program of BRU and were taking ET for the first time. The students have finished taking the basic courses in English and were on their year where they had to study their major courses which included ET. These participants were chosen because they were taking the course, English for Tourism, where they needed to remember a large number of words in order to be an efficient guide to local and foreign tourists who visit the historical places in Thailand particularly in Buriram province, Northeast of Thailand. They have to be prepared to

work in their own chosen field. In helping the students, the researcher decided to use BCA using the brain-based principles created by Caine and Caine (1994) in developing their vocabulary retention. It was the aim of the researcher to find out whether this teaching approach would be effective to the students' vocabulary retention and recall or otherwise.

All students were required to take the pre-test, post-test and two delayed post-tests. Five of the students who got the highest scores and five students who got the lowest scores in the pre-test were closely observed respectively. They also wrote their diaries and were interviewed after the sessions ended. The interview questions were based on the students' performance in class and based on the things that they have written in their diaries. This was to see how BCA affected the high-scored and low-scored students before and after taking the course and have undergone the planned instruction.

3.3 Variables

In this study, the independent variable was the BCA that the researcher employed to see if it helped in the vocabulary retention of the students. The dependent variables were the test scores of the students, their behaviors, and their reaction to BCA because they could be measured and could not be manipulated or controlled.

3.4 Instruments

3.4.1 Pre-test

The pre-test was a 60-item vocabulary test given before the instruction began. It consisted of the words needed to be used by tour guides in their field of work

especially in the Northeastern Region of Thailand. This test was given to evaluate the vocabulary knowledge of the students before presenting them the actual lesson and activities. The words that the students know the least were separated and were used for the lessons as well as for the post-test. The pre-test result also helped determine the students' vocabulary development and retention with the use of BCA before and after the instruction.

The pre-test consisted of multiple-choice items which were piloted to the third year students who were majoring in English but were in a different group with the participants of this study. Both the pilot group and the participants studied the basic courses in English for two years and they started taking major courses during the term-1 of Academic Year 2010. The piloting of the pre-test was to ensure that test problems were taken into considerations and that the time and information were correct and appropriate prior to giving the students the real test before the BCA instruction. This helped the researcher see whether the test questions were too hard or too easy for the students to answer. The result of the pre-test was used in creating the test for the post-test and the two delayed post-tests.

Two experts checked the pre-test and post-tests. They have the following qualifications:

- native speakers of English.
- been teachers for at least five years.
- have at least a bachelor's degree in English language or related fields.

3.4.2 Immediate post-test and delayed post-tests

The immediate post-test was given after the English for Tourism course ended. It consisted of 30 items using the words that most of the students missed-out during

the pre-test. A delayed post-test was given two weeks after the students have taken the immediate post-test. A second delayed post-test followed three weeks later to see if the students can still remember the words after this amount of time.

The contents of the delayed post-tests were basically the same items as given in the immediate post-test with slight differences on the context which will be changed to challenge the students' ability to retain and recall. The vocabulary sequence was moved around and the order changed. This test helped the researcher see whether BCA was effective for this group of students or not.

Sokmen (1997) suggests that a teacher needs to provide ways to encode the words initially, then retrieve those words subsequently with different intervals. Thus, the purpose of two delayed post-tests was to see whether there was retention on the part of the students with the target words that they learned in class. It was necessary for the students to recall the words they learned during the instruction and would be using in their field of work as tour guides. The result of this series of tests paved the way to see the effectiveness of BCA in the vocabulary retention of the students and their ability to recall the words they learned. Furthermore, two delayed post-tests were given to ensure the validity of the students' retention after a period of time.

3.4.3 Word List

The word list is a set of words designed for the students to remember as they were learning English for Tourism. These words were selected by the researcher as a result of previous teaching experience in the same university. These were the words that the students had difficulties with but that they needed to remember and apply in their field of work as tour guides in Buriram province. The target words were used in

the pre-test and were cut into half for the immediate post-test. The words which the students have difficulty with during the pre-test were the focus of the post-tests.

The words included in the list were the following:

sanctuary	carve	villages
castle	lintel	countryside
laterite	restore	gallery
century	archaeological	forests
stupa	historical	panorama
replica	edifice	meadow
shrine	magnificent	package
arrival	worship	original
arrangement	excavate	tower
ancient	convenient	rocky
extinct	sandy	alley
commemorate	itinerary	summit
annually	paddy	spectacular
reign	monument	chamber
procession	temple	craft
pillar	nearby	pottery
competition	isolated	kiln
stairway	explore	lush
attraction	sandstone	region
prang	culture	pediment

The words were chosen in relation to the researcher's previous teaching experience in teaching English for Tourism. The words listed above were those that students have difficulty in remembering after the lecture has ended. These were the words needed in working as a tour guide in Buriram province, Northeast of Thailand. Students had a hard time getting these words right during the tests conducted by the researcher in the previous term. The researcher decided to include them in this list to see if the students would be able to learn differently using a different teaching approach.

3.4.4 BCA – lesson plan

The BCA lessons were the activities prepared by the researcher to make the students learn the course and develop vocabulary retention. The activities in these lessons were based on the brain-based principles by Caine and Caine (1994). These principles were adapted by the researcher in creating lessons and activities to challenge the brain and make learners learn and retain what they learned.

Two experts were asked to check the lesson plans to ensure its validity and content: a tourism field expert and a language expert. These two honorable experts were able to help the researcher stay focused on the subject matter.

The tourism field expert has the following qualifications:

- has been teaching Tourism courses to university students for at least two years
- proficient in English language

The language expert has the following qualifications:

- a native speaker of English
- has at least two years of experience in teaching
- a well-traveled person

A sample lesson plan using BCA can be seen in Appendix C.

3.4.5 Observation

As the researcher employed BCA to the group of students, the learning behaviors of the five higher-scored and five lower-scored students during the pre-test were observed in order to find the differences from the first day they came to class to the very last day. Classroom observation helped the researcher determine any particular changes in these students' participation or involvement in the given activities. Moreover, it helped determine if the positive changes in students' behaviors in class would lead to effective learning, or if it would inhibit their learning or would make no difference at all.

Since the researcher was also the teacher of ET course, a hired camera man was asked to take the video from day one to the last day of classes.

3.4.6 Students' Diaries

Ten students, composed of the top five students in pre-test score and five low-scored students, wrote down their classroom experiences and their reaction to what they have learned in the English for Tourism class using BCA. Students were given the freedom to write their reaction using the language they were comfortable with, which means that they could write using their first language if they would choose to.

Some guide questions were provided such as:

- A) What are the activities you did in class today?
- B) What did you feel when doing those activities?
- C) Was there any particular activity that you like the most? If so, what was it?
- D) Did the activities used by the teacher help you in your studies?
- E) Did the activities used in class help you in understanding and remembering more words?

The students were free to write in their own language to encourage them to express their minds without reservation or fear of being corrected for grammar or language mistakes. However, the researcher's first language is not the same as the students, so an expert translator was asked to translate what the students have written. The translator has the following qualifications:

- a native Thai speaker
- has at least one year experience in translating from Thai to English and English to Thai
- fluent in English language

3.4.7 Interview

A semi-structured interview was conducted with ten students to explore further how and when BCA affected or made an impression on their learning. The researcher prepared five questions to ask the participants based on the result of the observation, and the information collected from the diary. Questions that came up in between during the interview were also considered since students were expected to express themselves. The five questions were used to guide the researcher to remain on the topic and not digress to another topic during the interview.

The ten participants were the five top-scorers and the five low-scorers during the pre-test. They were asked questions about BCA after the course ended. The researcher looked for a suitable place in the school where each student would not be distracted during the interview. Each participant was asked separately about the usefulness of BCA in their studies. Questions and answers to this interview were recorded.

3.5 Pilot Study

A pilot study was done prior to the actual study to determine the appropriateness of the tools or resources used in gathering the data. This helped develop the steps employed in the study and foresee the problems then apply necessary measures to correct them before proceeding to the actual research. Furthermore, it helped determine the process involved in the research and the duration of time needed to perform certain tasks in collecting the data. The participants in the pilot study had the same level or qualifications as the population in the real research.

3.5.1 Participants

The study on the effects of brain-compatible activities for vocabulary retention in English for Tourism was piloted with the third year Bachelor of Arts students who had the same qualifications as the participants of this study namely; both groups have finished the Basic English courses, both groups were in the same year level of their undergraduate courses, and both groups needed to study English for Tourism prior to getting a degree. There were twenty-eight students who participated in the pilot study; twenty-five females and three males.

3.5.2 Research Instruments

3.5.2.1 Pre-test

The pilot study started with a pre-test of a 60-item multiple choice focusing on the vocabulary that the participants of this study learned in class. The researcher would like to see whether the time allocated for the test was enough or if an adjustment would be necessary. It was vital to know whether the students would be able to understand the vocabulary used in the test and if the test would not be overly easy or too difficult for them. The result of the test would be analyzed using the Items

Analysis System (IAS) developed by Associate Professor Dr. Kanit Khaimook (2004) from Suranaree University of Technology in Thailand.

3.5.2.2 Lesson Plan

After the test, the lesson plan prepared by the researcher was used in teaching the students for one session. The purpose for this study was to determine the time needed to finish the entire lesson including the effectiveness of some of the activities prepared by the researcher.

3.5.2.3 Observation

The one-session class was video-taped during the pilot study to see whether the activities prepared in the lesson plan have some positive effects on the students' behaviors in class regarding attentiveness. It was important to see the students' behaviors in implementing the activities since these were the strategies in remembering the vocabulary learned in class and in retaining the lessons learned during the study.

3.5.3 Data Collection

The pilot study was done a week before the actual research was conducted. The twenty-eight students were asked to take the test for an hour. The test was analyzed using the IAS to see whether the test items were appropriate for the students or not. After the test, the researcher then proceeded to teach the lesson using the brain-compatible activities lesson plan that was prepared for this study. A video recorder was mounted in one area of the room to re-assess and support the teacher's observation during the session.

3.5.4 Data Analysis

3.5.4.1 Pre-Test

The result of the test was analyzed using the IAS (Item Analysis System). Each item was carefully checked and reviewed based on its difficulty level.

The result of the test as analyzed using IAS is summarized below:

Table 3.1 Result of the test item analysis

Item	p	r	Result Analysis
1	0.179	0.066	Too easy
2	0.500	0.024	Too easy
3	0.536	0.250	Appropriate item
4	0.643	0.234	Appropriate item
5	0.643	0.200	Appropriate item
6	0.286	0.407	Too easy
7	0.143	0.053	Too easy
8	0.536	0.576	Appropriate item
9	0.464	0.305	Appropriate item
10	0.321	-0.115	Appropriate item
11	0.214	0.1997	Too easy
12	0.214	0.137	Too easy
13	0.107	0.223	Too easy
14	0.321	0.233	Appropriate item
15	0.286	0.064	Too easy

Table 3.1 Result of the test item analysis (continued)

Item	p	r	Result Analysis
16	0.357	0.106	Too easy
17	0.429	0.014	Too easy
18	0.214	0.316	Too easy
19	0.250	0.634	Too easy
20	0.143	0.193	Too easy
21	0.286	0.298	Too easy
22	0.500	0.269	Appropriate item
23	0.393	0.517	Appropriate item
24	0.214	-0.021	Too easy
25	0.214	0.058	Too easy
26	0.393	0.084	Too easy
27	0.071	0.052	Too easy
28	0.607	0.199	Too easy
29	0.071	-0.232	Too easy
30	0.750	0.249	Too difficult
31	0.464	-0.054	Too difficult
32	0.643	-0.021	Too difficult
33	0.143	0.262	Too easy
34	0.321	-0.115	Too easy
35	0.321	0.286	Appropriate item
36	0.071	-0.074	Too easy
37	0.107	-0.040	Too easy
38	0.500	0.496	Appropriate item

Table 3.1 Result of the test item analysis (continued)

Item	p	r	Result Analysis
39	0.464	0.060	Appropriate item
40	0.464	0.076	Appropriate item
41	0.607	0.349	Appropriate item
42	0.357	-0.047	Appropriate item
43	0.357	0.123	Appropriate item
44	0.286	0.623	Too easy
45	0.500	-0.382	Too easy
46	0.107	0.117	Too easy
47	0.607	0.349	Appropriate item
48	0.214	0.197	Too easy
49	0.143	0.076	Too easy
50	0.214	0.336	Too easy
51	0.321	0.477	Appropriate item
52	0.214	0.118	Too easy
53	0.250	0.296	Too easy
54	0.214	0.157	Too easy
55	0.250	0.146	Too easy
56	0.286	0.010	Too easy
57	0.143	-0.226	Too easy
58	0.107	0.012	Too easy
59	0.214	0.098	Too easy
60	0.018	-0.589	Too easy

CKR20 = 0.434

Out of 60 items, 39 of them were considered too easy, 3 items were considered too difficult and 18 items were appropriate for the test. Test items which were too easy and too difficult were changed and the items that were considered appropriate were kept for the actual research.

The formula used in finding the consistency of the test is $0.3 \leq p \leq 0.7$ and $r \geq 0.2$ with $KR20 = 0.75$. In the result of the pilot test, $KR20 = 0.434$, which means that the test was not homogenous and therefore, some items needed to be changed to make it more reliable.

3.5.4.2 Lesson Plan

The lesson during the pilot study lasted for three-and-a-half hours which exceeded to the original plan of teaching the course for two-and-a-half hours per session. Thus the researcher had to minimize the activities to make the objectives attainable within the time limit.

3.5.4.3 Observation

The researcher viewed the video tape after conducting the study and found that the students were very enthusiastic in the beginning of the lesson but they got exhausted after performing one activity after another. It means that the researcher should cut down some activities to minimize the teaching time and to let the students have enough energy to finish the lesson in each setting. The students found it difficult to understand the activity on “Practice” part of the lesson plan.

3.5.5 Results and Findings

3.5.5.1 Pre-test

The result of the pilot study showed that the many items included in the test needed revision. The context clues and the choices of the items which the students find really easy needed to be changed.

3.5.5.2 Lesson Plan

The lesson that the researcher prepared for the session was too long and the lesson exceeded the time allotted to it. The activities failed to serve their purpose which was to motivate the students in remembering the vocabulary found in the lessons. The researcher had to cut down some activities in each lesson. The lesson plan needed to be shortened to make it sufficient for the time allotted to finish the study. The researcher revised the lesson plan using three important learning phases suggested by Caine and Caine (1994) in their book, *“Making Connections: Teaching and the Human Brain”*. These are: orchestrated immersion, relaxed alertness, and active processing as guide steps.

Due to time constraint and the result of the pilot study, the lesson was focused on one topic with the vocabulary that the students needed to know and remember to become effective in the field of tourism especially in the local area of Buriram. The researcher cannot cover so many topics with so little time. Thus Phnom Rung Sanctuary, the famous tourist attraction in the province which was built during the 12th century, became the topic of the lessons for the entire study.

3.6 Data Collection and Analysis

Table 3.2 Data Collection Time Frame

Week 1	Pre-test
Week 2,3,4,5	Instruction with BCA
Week 2,3,4,5	Observation
Week 2,3,4,5	Diary keeping
Week 6	Immediate Post-test
	Interview
Week 8	Delayed post-test 1
Week 11	Delayed post-test 2

3.6.1 Pre-test

The pre-test was given to the students prior to receiving the instruction using BCA in English for Tourism course. Participants was given an hour to complete the test on vocabulary. The test was conducted in class as a paper and pencil test.

The pre-test result was used to determine the words to be tested for the immediate post-test. The result of this test also helped the researcher in finding the five top-scorer and five low-scorer students who were observed, wrote diaries and were interviewed.

3.6.2 Immediate post-test and delayed post-tests

Immediately after the sessions ended, a post-test was given to the students to check on their vocabulary knowledge after attending BCA classes. Two weeks after the post-test, the students took a delayed post-test with the purpose of checking their

learning retention. Another delayed post-test followed three weeks thereafter to see if the students could still remember the words they learned in class or not anymore.

The test results were analyzed using the paired sample t-test statistical tool to find their level of significant difference. The means of the post-tests were compared to each other to check whether the students have retained the words they have learned in class after a given period of time.

3.6.3 Observation

While the students were studying the course on English for Tourism and learning the skills on vocabulary retention, ten students were observed to see whether there were changes in their behaviors particularly in class participation during this period of time. The researcher used a video camera to record the class sessions and the activities for the particular lessons.

3.6.4 Students' Diaries

Ten students who were determined according to their scores in the pre-test kept their diaries every time the session ended. They had to keep their observation and experiences in their diary notebooks. The diary notebooks were collected at the end of the course and were analyzed qualitatively. The contents in the diary were reviewed, coded, and grouped to find the themes.

3.6.5 Interview

The same ten students who needed to write the diaries and were observed were also interviewed using the questions prepared by the researcher after the course ended. Each student was given enough time to answer the questions which was recorded and transcribed. They were given the freedom to express themselves in the language that they were comfortable with.

The interview questions were formulated after noting the observation and reading the contents of the diaries. Interview answers were analyzed qualitatively. Positive, negative and neutral opinions were classified and substantiated by raw data.

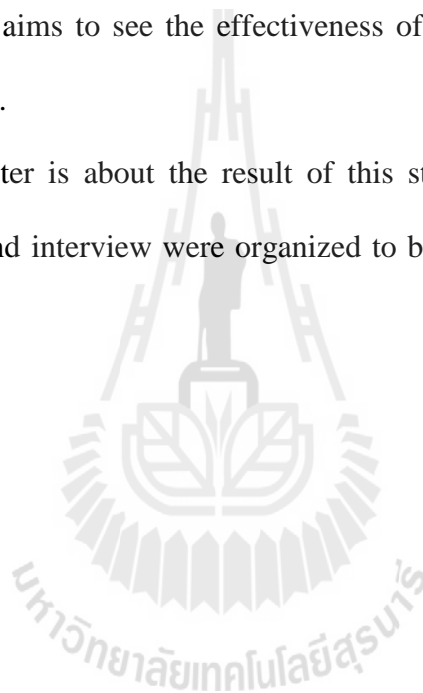
Table 3.3 Research Plan Table

Research Questions	Data Sources	Data Collection	Data Analysis
RQ 1 – Is there any significant difference between the students' vocabulary knowledge and retention before and after attending the instruction using BCA?	Pre-test Immediate Post-test Delayed post-test 1 Delayed post-test 2	Week 1 = pre-test Week 6 = post-test Week 8 = delayed post-test 1 Week 11 = delayed post-test 2	Paired sample T-test
Research Plan Table (continued)			
RQ 2 – Do brain-compatible activities (BCA) affect the students' learning behaviors in class? If so, how?	Observation Students' diary Interview	- All through the instruction - After every session - Week 6	Qualitative analysis
RQ 3 – What are the students' reactions to BCA in learning vocabulary?	Observation Students' diary Interview	- Throughout the instruction - After every session - Week 6	Qualitative analysis

3.8 Summary

This study is both quantitative and qualitative research which was carried on for 11 weeks to complete the gathering of data. There were 31 participants in this study who were taking the course, English for Tourism at Buriram Rajabhat University. The use of triangulation was considered in this research to ensure its validity, thus the researcher gathered the data through tests, observation, diaries and interview. This study aims to see the effectiveness of brain-compatible activities to the university students.

The next chapter is about the result of this study. The results of the tests, diaries, observation and interview were organized to be able to answer the questions posted for this study.



CHAPTER 4

RESULTS OF THE STUDY

This chapter presents the results of the study by using the research questions as framework. The questions posted on this study are the following:

RQ1: Is there any significant difference between the students' vocabulary knowledge and retention before and after BCA instruction?

RQ2: Do BCA affect the students' learning behaviors in class? If so, how?

RQ3: What are the students' reactions to BCA in learning vocabulary?

To answer the questions, the data from the pre-test, immediate post-test and the two delayed post-tests, the observation, the students' diaries and the semi-structured interview are presented and discussed. As mentioned in Chapter 3, ten students were asked to write the diaries. The same ten students were observed along with the other classmates and were interviewed; five out of these ten students achieved higher scores during the pre-test while the other five had low scores respectively.

The observation was noted, the diaries were read and those written in Thai language were translated, the interview was transcribed and some of the answers which were in Thai language were translated into English by getting the gist or the meaning of what the students were trying to say. Some of the students' answers and logs were quoted in this chapter to support the given answers to the research questions. In quoting the interview, however, the researcher omitted the "uh's" and

“yeah’s” as the students answered the questions to keep the message flowing since such expressions do not change the message even upon omission. In other words, those expressions are not very necessary to be noted down and their absence does not alter the information that the students shared. The spaces and silence of the discourse are represented by the many dots, which meant that the students took time in answering or that the students were a little bit quiet and were on the process of thinking for the right words to say during such time.

4.1 Results

4.1.1 Research Question (RQ) 1: Is there any significant difference between the students’ vocabulary knowledge and retention before and after attending the instruction through using BCA?

The answer to RQ1 is divided into two parts. The first part shows the vocabulary knowledge gained by the students before and after attending the BCA instruction. The students’ scores for the pre-test and the post-test were compared to answer this query.

The pre-test was a sixty-item multiple choice test which was cut down to thirty questions for the post-test and the retention tests that followed. In comparing the scores of the students’ pre-test and post-tests, the researcher took thirty items in the pre-test with the lowest points and used the students’ scores to compare with the students’ scores of the post-test. The summary of the results is shown in the table below.

Table 4.1 Results of the students' pre-test and immediate post-test

Subjects	Pre-test Mean	SD	Post-test Mean	SD	Sig.
31 students	3.61	1.58	14.29	3.37	.013

Significant level is at .05

Table 4.1 shows that the mean of the students' scores in the post-test is higher than the mean of their scores in the pre-test. Accordingly, the result shows a significant difference between the students' scores in the pre-test and the post-test.

The students may have previously known many of the words used for this course from their other courses or from other sources since it is centered on the most famous tourist place in the province. The pre-test gave the researcher the idea regarding the words that the students knew very well and the words that they knew the least or do not know at all. Below is the table showing the points that the individual students got during the pre-test and the immediate post-test respectively. To get the percentage of the pre-test and post-test scores' difference, the researcher subtracted each of the students' pre-test scores from the immediate post-test scores and divided the results with the total number of items which is 30. Such difference could be able to show which student did well during this study and which ones did not learn much.

While it is true that the researcher decided to choose five students who scored high and the other five who scored low during overall result of the pre-test mostly for observation and interview purposes, all the students' learning outcomes were quantified and analyzed as seen in the table below.

Table 4.2 Individual results of the students' pre-test and immediate post-test

Students	Pre-test	Immediate Post-test	Scores' difference
1	7	18	37 %
2	3	17	47 %
3	3	12	30 %
4	4	13	30 %
5	1	14	43 %
6	4	10	20 %
7	2	12	33 %
8	4	14	33 %
9	4	15	37 %
10	5	9	13 %
11	4	10	20 %
12	2	9	23 %
13	3	11	27 %
14	5	13	27 %
15	2	12	33 %
16	2	16	47 %
17	2	14	40 %
18	3	17	47 %
19	4	14	33 %
20	3	16	43 %
21	5	24	63 %

**Table 4.2 Individual results of the students' pre-test and immediate post-test
(continued)**

Students	Pre-test	Immediate Post-test	Scores' difference
22	7	20	43 %
23	6	18	40 %
24	3	14	37 %
25	4	14	33 %
26	3	12	30 %
27	4	14	33 %
28	5	15	33 %
29	5	20	50 %
30	3	13	33 %
31	0	13	43 %

Table 4.2 shows the scores of the students with the corresponding percentage of the pre-test and immediate post-test's difference. It can be seen that even though the students' scores increased remarkably, their vocabulary knowledge before and after taking the course did not show a hundred percent absorption and recall.

S21 got the highest increase of 63% among the participants while S31 who got nothing in the pre-test showed a 43% increase in the post-test. The average of the students' vocabulary knowledge is 36% which means that most of them learned at least 11 words during the entire BCA sessions.

The second part of the answer to RQ1 is focused on the vocabulary retention of the students. The students' scores to the immediate post-test, the first delayed post-test which was given two weeks after the immediate post-test, and the second delayed post-test which was given three weeks after the first delayed post-test were compared and analyzed. The summary of the data is shown in the table below.

Table 4.3 Results of the students' retention tests

Subjects	Post-test Mean	SD	Delayed Post-test 1 Mean	SD	Delayed Post-test 2 Mean	SD	Sig.
31 Students	14.29	3.37	13.35	3.67	13.13	3.83	.000

Significant level is at .05

Table 4.3 shows that there is a significant difference between the students' scores during the immediate post-test, first delayed post-test, and second delayed post-test. It means that the words that the students remembered after the BCA sessions have ended were retained in the students' memories even after sometime. Consequently, the BCA was believed to have a good effect on the students' vocabulary retention, although one cannot boast of a hundred percent long-term memory retention in this case probably due to the limited time spent in conducting this study as shown in the table below.

Table 4.4 Individual results of the students' retention tests

Students	Immediate Post-test	Delayed Post- test 1	Delayed Post- test 2	Scores Indication
1	18	15	14	***
2	17	17	15	***
3	12	12	13	*
4	13	14	13	***
5	14	14	13	***
6	10	9	8	***
7	12	12	12	**
8	14	12	10	***
9	15	13	13	***
10	9	7	6	***
11	10	8	6	***
12	9	8	8	***
13	11	11	9	***
14	13	14	13	***
15	12	12	6	***
16	16	16	15	***
17	14	14	14	**
18	17	17	16	***
19	14	11	8	***
20	16	11	10	***
21	24	24	22	***

Table 4.4 Individual results of the students' retention tests (continued)

Students	Immediate Post-test	Delayed Post-test 1	Delayed Post-test 2	Scores Indication
22	20	20	19	***
23	18	17	15	***
24	14	14	11	***
25	14	11	9	***
26	12	12	11	***
27	14	14	14	**
28	15	15	11	***
29	20	18	19	***
30	13	13	9	***
31	13	13	11	***

* increased scores = 1 student ** the same scores = 3 students ***declined scores = 27 students

Table 4.4 shows the individual students' vocabulary learning and retention immediately after they finished the BCA sessions until the fifth week. While table 4.3 reflects the overall result of the students' retention of knowledge with the words that they learned during the sessions and that such result showed a statistical significant difference, table 4.4 reveals that such knowledge declined after a few weeks of ending the classes when looking at the individual scores. Among the thirty-one students, only one of them had a slight increase of the score. There is a possibility of remembering the word after a period of time if the student heard it somewhere else or had come across the word in their reading. Three students maintained the same scores for the

retention tests. These students probably learned the words by heart and were able to transfer such knowledge in their long term memory thus remembering them even after some time. Twenty-seven or majority of the students showed a decline in their scores. It could be because they did not think of using those words again and the retention tests caught them off-guard. It could also mean that the students enjoyed the activities done during the BCA sessions, yet did not commit most of the words in their memory for lack of relevance in their life.

To sum it up, the students' vocabulary knowledge increased after BCA sessions had ended. However, the increase was not remarkably high as each score of the students was analyzed. Additionally, it also showed that the students remembered most of the words that they had learned in class during this study. In congruence to the individual result of their vocabulary learning, the students' retention also showed some decline of the words that they remembered five weeks after the BCA sessions have ended.

4.1.2 Research Question (RQ) 2: Do Brain-compatible Activities (BCA) affect the students' learning behaviors in class? If so, how?

The observation field notes, students' diaries, and semi-structured interview were used to answer RQ2. It was found that the students' behavior dramatically changed for the better as they attended the sessions using the BCA. The results were compared from the first day to the last day of the sessions. The brain-compatible activities (BCA) done in class were the following:

- Starting class sessions: The class sessions started with greetings and an overview of what the students would be learning for the day. This would help their brain to think of what to expect or what would be happening

during the sessions. This was also used to review the past lessons and discussing something that was relevant to the class like talking about rules.

- **Friendly environment:** The students were seated in a U-shape, facing each other and the teacher. The U-shape helped the students to think in a wider perspective since there was more room to move. The teacher's smiles and nods of approval when students would give the correct answer and subtly let them know if they were wrong made them feel that they were accepted and being understood. Correcting the students in a very friendly way and laughing with them if there was something funny created an atmosphere of relaxation. These activities helped the students' brain stay at ease and not be threatened allowing them to participate and cooperate in class activities.
- **Tricks:** The use of games or counting off when dividing the students into different groups so they would not be able to choose the members of their group. Before the presentations, the students had to pick up a number to determine who would present first. Whichever group got number one had to go first. It had always been fun for them to see who would get to be the first to go to the front and who would be last. Before each group would present, a female student was assigned to be the "director" and she had to stand in front and clap her hands together as if in filming a movie as everyone shouted, "ACTION!" This would always make the students laugh and was a great way to let the oxygen get into their brains. All the tricks used in class were little things that added to the students' curiosity and made them anticipate what would come next.

- Contests: Spelling contests were used to enhance their vocabulary knowledge. The brain works well when it is alert. It remembers well when learning is fun.
- Oral repetition: Repeating the words again and again would help their brain in storing the knowledge to their long term memory. The students had to read the new words presented to them the moment it was shown. The teacher gave the clues to make the students understand the meaning of the word, then they had to use it in a sentence, after that they had to read the word again. When the presentation was over, the students had to read all the words one more time. During the activities, they had to use the words they learned and they would hear those words again and again during the teacher's presentation of the lesson.
- The use of music: Music was used to keep the students' brain relaxed especially when they were preparing for the presentation or when they were with their groups. It had a very good effect on the students as it kept their minds working and not get bored even when they were done with their preparation and were just waiting for the others to finish. Country music was used in this study because the students requested for a certain performer's songs to be played. Moreover, these students are teenagers and they reacted better with this kind of music than the instrumental. Additionally, music was used during the time when the students were preparing for their presentations wherein they brainstorm ideas with the members of their groups. The purpose of playing it is not to keep them

meditative but to make them feel better as music affects the brain in different ways.

- The use of colors: Attracting the attention of the students so as to have their minds focused on what the teacher was trying to share with them. This was used during the power point presentations where the background was changed for each word or the words were written in different colors but the background was the same all throughout the presentation. The teacher also used different colored markers to emphasize important things on the board while explaining something.
- Diary writing: This helped the students express themselves in a free manner without the fear of being judged. The diaries were personal notes of the students' feelings while taking the course. This helped the students remember the activities done during the sessions and thus remember the words that were incorporated when they were having fun.
- Telling the students the information about the place by telling them a story. In this way, their attention would be locked on the teacher and they would remember the details and information because it was very interesting to them.
- The use of collaborative and cooperative techniques: Students learned well from each other and they would feel comfortable being with friends in a social context which is very healthy for the brain because our brain is inherently social and it works well when working with other brains. The students loved our pair work and group work so much that it became the topic of their diaries. It encouraged them become friendlier with each other

which helped the class in various ways making it easier to get the information across.

- Field trip: taking the students to practice on-site by visiting the actual place and acting like they were doing it for real. This made the students feel that they were in a real situation and that they needed to do their best to give the proper information to the tourists.
- Presentations: It included role-playing, individual or group presentations, and describing a place or a picture. This helped build the students' confidence by talking in front of peers and sharing their ideas without being afraid of being criticized or mocked. It was also the students' time to act out or be themselves. They could change their voice or pretend they were someone else as they presented. They could do whatever they wanted to as long as it was connected to the lesson and the things that they were presenting, enhancing creativity and improving presentation skills
- Feedback: In class, the students would immediately get feedback from their teacher, especially during the presentations. This helped the next presenters prepare and/or correct themselves before going to the front. During the field trip, however, feedback was given as we were all on the bus on our way back to the university. All feedback was done in a very friendly manner so that the students did not feel threatened at all. Instead, they believed that the teacher was really concerned about their studies and their future.

The activities mentioned above were combined together in a session making the students experience a classroom filled with anticipation, relaxation, fun and

excitement. Some of the students were very vocal in their preferences of the activities done in class as quoted from their answers to the interview:

“I like the activities in class... especially the presentations, the writing of diary, the group works.... I like the field trip more because we go to the place and use what we learn in class and we become tour guide for one day. It was fun and exciting to go there and see Phanom Rung and describe Phanom Rung to the students who are tourists.” (S21)

“I like.. game in class...about lesson... everybody funny and relax.” (S16)

In reporting the results of this study qualitatively, the students' answers to the interview, the quotes from their diaries and the observation notes of the teacher were all italicized and in quotations.

To further clarify the answer to RQ2, the researcher divided the results into three parts: the students' learning atmosphere, the student-student interaction, and the teacher-student interaction.

It must be noted that the teacher did not correct the students' grammar in their diary writing giving them the feeling that they were free to write whatever would come to their minds nor were there any grammatical changes done for these writings. It was the researcher's aim to allow the students to write anything that would come to their brain so they would be able to express themselves without being threatened of committing mistakes or of being corrected. Furthermore, the students were allowed to use their first language, which is Thai, in writing their diaries and in answering the questions during the interview. English language was primarily used in the classroom except during the group activities where the students could discuss the contents in Thai but they had to do the presentations in English.

4.1.2.1 The students' learning atmosphere

Learning in a fun way

The teacher's field notes and student's diaries showed that the students' field trip was very beneficial for their additional learning and experiences:

“During this trip, the students learned from remembering the things that they needed to present as well as those that they heard from the other groups' presentations. They all had fun. Letting them describe the actual things at the real setting was very helpful for them to remember and recall the words they learned in class. (Session 4 – Field trip to Phanom Rung)”

“Today I went to Phanom Rung with my friend and teachers. We are enjoyed and so tired in this trip. I talk about historical of Phanom Rung to second year students. I think it good for me because I practiced English speaking.” (S16)

Below are the excerpts taken from the students' answers during the interview. They were talking about the things that they learned in class and how they were different compared to the previous term when they were studying with the same teacher:

“Before, teacher know that I sleep in class... but now I don't sleep because I interest with the lesson and activity. I also learn to be tour guide for other groups. Finally, I love the class because it's fun.” (S3)

“I presented at place in Phanom Rung and answer the question to tourist. I knew word such as lintel, architecture and many words in

Phanom Rung and use it for tell the information. Finally I had very enjoy together with my friend.” (S20)

“I learn many words because I remember the picture (Teacher’s note: The student was talking about the pictures used in teaching them the vocabulary in the classroom which helped facilitate memorization of the words needed to be learned.) and when I go to Phanom Rung I remember them. Also the information about historical place and how to take care of tourists when I become a tour guide.” (S22)

With the fun and enjoyable way of learning the course, the students became interested in the lessons. This led to remembering the words that they were learning in class and using them when the situation called for it.

Favorable Classroom Environment

Aside from the personal development that the students gained while attending the sessions and the enjoyment that they felt in class, they also learned to be better students. The constant tardiness, unnecessary noise inside the classroom like chatting or talking with their friends, passivity in any class activities, and the usual prompts to go to the rest room every now and then were diminished. They became more disciplined individuals who learned to wait for the time when they were allowed to go out for a few minutes, listened to their teacher and friends during the presentations, and worked on the requirements for the course. They learned to come to class on time, joined in the class activities, and learned to work with other students in their class.

The seating arrangement, which was changed into a U-shape; the teacher’s friendly style of letting the students know when they committed mistakes

with their answers and the nods when their answers were right, letting the students know what to expect from the session, the feedback, the games and presentations, the story telling, the music played in class while the students were preparing for their presentations were the activities done in class which the researcher believed to have contributed to the better interaction between the students with their teacher.

In the teacher's notes from the beginning of the session to the last, one can see the changes in the students' behaviors and how they interacted with their teacher while taking this course. The observation notes started with the problems of the students' tardiness and passivity in class at the beginning of the term.

"It was the beginning of the term and the course commenced as well. All the students showed up to class, although many of them were late... Before the lesson started, I changed the sitting arrangement into a U-shape to allow a better interaction between the students and the teacher and their fellow students. I asked them to stand up and arrange their seats. They obeyed lazily." (Session 1- observation notes)

"I started with the lesson and presented the words to the students. I used pictures to make them understand each word and how to use them. Some of their classmates just arrived, which meant that they were twenty minutes late already. I called out for those who were late, telling them that they cannot be late anymore next time. I asked them to stand to the front and tell everybody the reason of their tardiness. Time was already wasted and the possibility of not finishing the lesson for the session was inevitable." (Session 1- observation notes)

The teacher/researcher tried many ways to encourage the students to come to class on time. There was a few times during the previous term when the late students were asked to sing or dance or say something in English before they were allowed to sit down. Such strategies did not have any effects on the students. For this study, the researcher used the activities as reasons for the students not to come late. They were told that if they would come late, there would be a great possibility that they would miss out some fun activities. It would be better if they could come before or on time so they could also have fun with us. It was noted in session three that the students came very early and they even prepared the room themselves without waiting for any instructions from their teacher.

“The students arranged the seats on their own this time, in a U-shape. They all came ahead of time and waited for me filled with anticipation for the activities of the day. They also prepared the microphone and projector and made them ready to use for our class.” (Session 3 – observation notes)

Some of the students reflected the changes in their diaries. They mentioned that they learned to come on or before the time during this study.

“.....I learn not to come late and working with my friend.” (S3)

“I am happy that I come to class not late. I can learn many things and also play with my friend in activities.” (S16)

It shows that the students tried their best not to miss the activities in class. For that reason, they had to come on time. Their presence in class was very important for them to learn and be a part of the activities that their classmates enjoyed doing.

Cooperation and Participation

Another remarkable change that the students showed during this study was that from being passive, they became participative and cooperative during the class activities.

We had a spelling contest using the words I just presented to them. Some of the students tried to help their team mates by shouting the spelling or the next letter. I told them to stop doing it because they cannot help them that way. There was laughter all over the room. They started cheering their team mates in an encouraging way without dictating the spelling of the word that they needed to spell. The classroom atmosphere during this time was very different compared to the previous term. At that time, this class was divided into two: those who would want to participate all the time which were very few, and those who were only concerned of how pretty they would like to be while attending classes. Most of them did not want to participate because they would just allowed two or three of their classmates to answer all the time. With the BCA done in this class, they learned to be a part of each other in one classroom. They learned to give each other a chance to talk and join in the activities. (Session 1- observation notes)

“On the bus, a group of students composed of three members, prepared games for everyone. They had candies as prizes for those who would answer their questions. They made the so-called “tourists” to guess about the time of arrival to Phanom Rung from Buriram

Rajabhat University, what time does it open, what time does it close...and so on. The students would yell the answer while raising their hands so the game coordinators ended up giving each one a piece of candy for every question.” (Session 4 – Field trip to Phanom Rung)

This activity was noted in one of the students’ diaries. This student was one of those who were responsible for the fun activities on the bus. They chose to have some trivia questions. They were excellent in coordinating the games. They prepared their questions and the prizes for those who would be able to answer the questions correctly. Everybody on the bus participated for this activity.

“Our group is responsible for game on the bus and we play by ask questions to friends like, ‘When is the festival in Phanom Rung?’ and we give candies if they answer correct. My friend and I were very fun and we did not sleep until arrival at Phanom Rung.” (S22)

The students’ changes from being passive to cooperative can also be seen in the students’ answers during the interview.

“Before, I shy very much and don’t know how to speak English. But my friend is friendly and teacher is friendly so I try. I learn how to present with tourists and with friend in Phanom Rung.” (S31)

S31 was saying that the real reason of her passivity before was that because she was shy. However, the friendly environment that she was in helped her change and she started to participate. S3 was saying the same thing. He also mentioned shyness as the reason for not participating in class. He was afraid that his classmates would laugh at him because of saying something wrong. The classroom’s

friendly environment made him change and helped him cooperate and participate in class.

“I try to participate before.... but my friend, they laugh when I talk...and I shy to talk and maybe commit mistakes. Now, it’s ok. My friend and I,... we can laugh and I don’t shy. I am brave now... because everybody is my friends. I know.” (S3)

BCA helped the students in many ways. They became confident as they mingled with each other and shared their ideas. The tasks given to them gave them the opportunity to share what was on their minds. With the friendly classroom atmosphere that the students were in, they realized that they could be themselves anytime. Thus, their attitude towards each other lightened up. They became friendlier with their classmates and more participative and cooperative with the activities given in class as well as during the field trip.

Confidence

The BCA done in class helped the students gain more confidence, learning to speak with their classmates in a group and as an individual in front of them was very helpful as quoted from S27 and S1’s diaries respectively:

“When I study, I like to play games and remember the words that my teacher teach. I like the presentation because it help me practice speaking and become confident with English language.” (S27)

“Presentation is my favorite. It give me confidence to stand and talk in English.” (S1)

The students’ confidence was also noted in the teacher’s observation during the class session.

“Each student was friendly with their peers because I could only see smiles on their faces. Unlike before when one or two of the students would make faces when a classmate whom they do not like would talk or share an idea. Such positive atmosphere encouraged those who were once shy to stand up and talk. Their confidence was evident as they presented using their facial expressions and body movements.”

(Session 3-observation notes)

When the researcher took the students to a field trip to Phnom Rung Sanctuary for an on-site class and actual practice of what they had been learning in class, some of the students wrote their experiences in their diaries and mentioned that the activity made them more confident. The knowledge they had about the place and the responsibility given to them as tour guides who had to take care and provide the right information to the tourists made them realize fully the importance of learning the language. Thus the trip became an enjoyable activity and a great tool of learning at the same time. Below are the quotes from the students’ diaries during the field trip:

“Today at Phnom Rung sanctuary we present informations about the lintel of Prasat Phnom Rung. I like this activities because it make me confident more and practice me to be good tour guide.” (S29)

“Today my classroom is Phnom Rung Sanctuary. We’re a guide to other students. For myself I present about the Naga bridge and I’m so happy. The activities are very important for improved my language. I’m confidently when I speak English with my teacher and friend. I like it.” (S31)

“Today my friends and I present about the eight petals of the Lotus at the Naga Bridge. I am very happy and confidence in presentation. I remember some words my teacher teach in class and I use to explain to other students who are tourist. After present, my friend and myself go to take the tourists to other section at Phanom Rung. I learn so many things about history and ceremony. I see the Lingam and lintels. I am very happy.” (S27)

Consequently, the students benefited from the favorable atmosphere they were in by learning as much as they could with the lessons during every session. As their confidence was growing, they also boasted of having learned several things in a fun way.

The students’ interaction with each other will be explored in the next section. Since almost all of the interactions done in this class were among the students themselves, it is only proper to find out the effects of such interactions in their studies and in their behaviors.

4.1.2.2 The student-student interaction

Pair work and group work

The students worked with their classmates most of the time during the BCA sessions. There was either pair work or group work in every session and the last session was a trip to the actual historical place which involved another group of students, the second year Bachelor of Arts who acted as the tourists. The participants of this study were grouped and each group was assigned a certain place of interest in the tourism site where they had to wait for the tourists and provide information. This activity was noted in the teacher’s field note.

“The students and the teacher invited another group of students with their teachers for a field trip. The trip was the session 4 of this study where the students had hands-on experience of the things that they had been learning in class.

At Phnom Rung Sanctuary, the students were given time to prepare themselves. The participants for the research were the tour guides while the invited students were the tourists. The tour guides were divided into different groups. Each group had to take care of the tourists in certain areas of the sanctuary. They had to describe either the carvings or the area of the sanctuary itself, or its function. They catered questions from the tourists and tried to answer them according to what they already knew. The tourists on the other hand, had to jot down the information they gathered for that trip because they were also asked by their teacher to submit a write-up. After the tourists were satisfied with the tour guides’ answers, they were led to the next area or station where another group of students were waiting. This was repeated until all the groups have presented and have answered the questions from the tourists.

During this activity, the tour guides enthusiastically welcomed the tourists as they approached the spot where they were assigned to describe or provide information to. Once the tourists were settled, the tour guides would start welcoming the tourists, introducing themselves, and describing about such certain area of the sanctuary. They were in good postures as they stood with confidence in front of

their school mates. Their voices were speaking with pride because they were the sources of knowledge that day. They were smiling as they spoke to show the tourists that they were friendly. The tourists on the other hand, were listening intently. They looked very eager to understand what the tour guides were saying. They listened to the tour guides and asked information when they wanted to. They were particularly interested in the Naga (five-headed snakes), the lintels and pediments, the library, the ceremonies and festivals at Phnom Rung, and Shiva's lingam. They asked many questions to the tour guides when they came to these areas of the sanctuary. The tour guides answered them willingly.” (Session 4 – Field trip to Phnom Rung)

One of the students also wrote about the things they did as well as her experiences when they went to the sanctuary.

“I ever been in Phanom Rung 2 time. I think everything in the sanctuary is still ancient and look beautiful. And for this time I go with friends and teachers for to be a tour guide. Everyone of my friends in my class are to be a guide in sanctuary. I am the first person to talk about sanctuary, I talk about history of Phanom Rung, and my friends talk how to go to Phanom Rung which open daily and can go by Phraconchai-Buriram highway. And then another guide groups take care the tourist (who are second years) when they are in the sanctuary.” (S21)

Before this study, the participants were not united in a sense that every time the teacher would ask them to form into groups or find a pair, they would choose

their friends and would not accept anybody who had no group if they did not like the person. At the onset of this study, however, the teacher used a strategy that would not allow the students to choose their partners on their own.

“I enumerated the tourist places that can be found in Buriram and gave descriptions to each tourist place. It was a short presentation because I did not want to bore the students with lectures. Then I showed them a sample dialogue about a tour guide and a tourist. They were to do the same with a partner. The students started to stand up and walked lazily towards where their friends were and chose their own partner. I stopped them by inviting them to play a game. We played, “The Boat is Sinking” where they had to group together into the number that I would tell them to or they would be punished by either singing or dancing. They began to get excited. I called out, “The boat is sinking, group yourselves into five!” Those who can not find a group had to stand beside me to wait for the others who could not find a group. Then we asked them to sing and allowed them to rejoin their friends after three rounds. The students were shouting, screaming, and laughing. I shouted again, “The boat is sinking, group yourselves into two!” One of them had no partner, so I asked him to join any group he liked. Whoever they were with, they had to practice a dialogue with that person. In this way, they could not choose whom to work with. The students did not show any negative reaction on this. They just went and did what they were asked to do without any complaints. They worked with anybody they were paired with during the game. During their

preparations, they would sometimes ask me to help them with their grammar or see if the vocabulary they used was alright but they posted no questions other than those.” (Session 1)

The strategies used in making the students find their pair or be into a group were very helpful in making them interact with the other students in class, not only with those whom they were close to. Such interaction led to the better relationship among the students.

Positive relationship with each other

By working with different people, the students learned to be nice to each other and thus created a harmonious atmosphere in the classroom. The grouping strategy mentioned in the teacher’s observation notes indeed helped a lot for the students to become comfortable with each other, thus having the ease of getting the idea across. With the better relationship that the students were experiencing, they would easily help others who would ask for help or not mess around with those who were still working. The teacher’s observation notes are as follow:

“I talked about Phanom Rung Sanctuary, its history, usage and then restoration. Pictures of the different parts of the sanctuary were shown as I talked. After giving them the information, I asked them to form into groups of three by counting off from one to ten. There were ten groups in all. All the number one’s should stay together, all the numbers two’s were another group, all number three’s and so on. Each group was given a picture related to the lesson. The students had to act as tour guides and describe to the class the picture they got. They had to tell us any relevant information about the picture as much as they could.

Each one went to their group and started discussing with their friends. I turned the music on to give them a common background noise which is very healthy for the brain. The students' facial expressions softened as they heard the music. They were looking very relaxed even when the task seemed difficult for them. When some of the groups were finished, they just sat there listening to the music while waiting for the other groups to finish. They were usually given the allotted time to prepare for their presentations. They had to stop talking soon as the teacher would call for the first group to present."

"I noticed that the students were now getting used to the idea that they would not be working with the person of their choice. They had no problems with it." (Session 2)

Additionally, the pair and group works helped in improving the students' ability to share their opinions with their classmates without the fear of being criticized or being laughed at. The students shared their feelings about working in a group during the interview.

"I like when talking with friends in a group. I'm not worried about English." (S21)

"... I like when you give me make a group activity and presentation about ...Phanomrung... it make me practice my language and change information or knowledge to my friend everyone." (S29)

"I like work with group and presentation. Everyone in my group have ideas. I feel happy." (S3)

In their diaries, the students also wrote about the good things they got from pair and group works.

“I have action like a tour guide in presentation. I like groups with friend because I can practice English speaking.” (S16)

“I show about tour guide with tourist. I am happy practice with friend. I am not shy to talk because the activities are conversation and I talk with friend. I think it fun to be excited with it.” (S30)

“I like to work with group because my friend help me. I do not like my friend before because she think she is very smart of all, but now she is very helpful and I like her.” (S20)

“The thing that I like most today is the conversation in group about Phanom Rung and I present Defloration Ceremony. Sometimes when with friend (in a group) I like to talk better and to present when everybody listen to me.” (S1)

“I like group work because I express myself not shy with friend and talk talk talk about information.” (S29)

Increased self-esteem

As each student in the class became comfortable with each other, their self-esteem had also improved. They started opening up in presentations and in sharing their ideas to the group as noted in the teacher’s field notes.

“S27 was very funny today. He normally doesn’t speak in class, but he presented today with all the actions and expressions he could muster and his friends applauded him.” (Session 2)

“I took particular notice of S31 during this trip. She got the lowest score during the pre-test and she would not participate that much in class. She was improving after every session as she presented without looking like the blood had gone out of her body. She could already smile as she would present in class. Today, during the trip and their tour guiding activity, she described the pediment and the lintels at the main tower of Phanom Rung. She did it so well that her classmates applauded her. On our way back to the university, her classmates were still talking about S31’s presentation at the site.” (Session 4- Field trip to Phanom Rung)

During the interview, the researcher asked S31 about her admirable presentation at Phanom Rung. Here was her reply:

“When I present in class.... I shy before, but now teacher ask us to present every time. My friend and I practice to speak so much... so.....so when we are at Phanom Rung, I know what to say....and I not shy because I know the information.” (S31)

The peer interaction helped improve the behavior of the students towards each other. The animosity that was present during the previous term disappeared as a result of the constant interaction with each other in either pair work or group work. The relationship of the students with each other has become friendlier. Such interaction also helped those who used to be shy to come out of their closet and began participating in class. The teacher’s friendliness also helped but it was the mutual respect and understanding coupled with acceptance that actually contributed much to the changes of the students’ behavior during the BCA sessions.

4.1.2.3 The teacher-student interaction

The interaction between the teacher and the students were not very harmonious in the previous term. They would just do whatever would please them like talking with their friends even when their teacher was explaining something in front or was giving them instructions. Even at the onset of this study, the students were the same. They did not mind their teacher who was standing in front.

“After asking the questions, I started with the lesson and presented the words to the students. I used pictures to make them understand each word and how to use them. I asked them to give me a sample sentence after explaining each word. It was a difficult task for them to encourage them to think. Most of them were talking with their friends. That was a noisy class.” (Session 1 – observation notes)

The teacher/researcher, however, prepared the activities for the day for the students' vocabulary learning. After presenting the words to the students, and asking them to use those words in sentences, the teacher asked them to form into groups for a spelling contest or games that would enhance their retention of the words learned in class. The activities used were good for repetition of the words that were introduced to the students so they would stick in their minds. Repetition of the words learned by the students coupled with the understanding of the meaning and usage of each word could enhance brain processing. As the words are repeated again and again in the minds of the students, such words will be hopefully retained in their memories.

“I presented the words and helped the students understand its meaning and usage by using context clues and pictures. I read each word once

and the students followed. We then had a spelling contest using the words I just presented to them.” (Session 1-observation notes)

“After the review, I showed them a power point presentation of the new words that the students needed to learn for the day. I used descriptions for the pictures and showed some acting so the students would understand the words better. After giving the description of each word, I showed the picture related to such word being introduced. After introducing all the words to the students, I went through the power point presentation and asked the students to read each word again. To enhance their vocabulary knowledge and to help them retain the words in their memory, we played the game called “Hear me!” I asked them to form into a big circle. Their left palms were opened up and raised to their shoulder level. Their right palm was facing down to the floor on the same level as their left palm. Each student had to place their right pointer on the other student’s left palm. When they were ready, I started reading a story about Phanom Rung which consists of the words we learned in class today. They had to keep really quiet and listen properly. Soon as they hear the word that we learned in class, they had to catch their friend’s pointer while taking their own pointers away from their friend’s palm. Everybody was laughing. They screamed as they took their pointers away and tried to catch their friend’s pointer. I made it so dramatic that I would slow down every time I get to the word that we learned in class. Some of the students got the clue. The students whose pointers were caught had to stay at the

center of the big circle and had to give us at least five words that were introduced today from their memory. Those who could not remember five words were helped by their classmates.” (Session 2 – observation notes)

“I started the lesson with the presentation of the new words as in the previous two sessions. In the same way, I used pictures to describe them as well as some actions or stories. Depending on the words, I would also use synonyms to make the words comprehensible. Then I would ask a student to use one of the words in the sentence. After presenting the words, we repeated the spelling contest to instill into the students’ head the importance of spelling the words correctly. Unlike the first session, I did not divide the class into two this time. I divided them into four, to make use of the space on the board and to shorten the time for this activity. The students were eager to win. No notebooks were allowed to be opened. I wanted them to spell from their memory. During the spelling contest, I used all the words we learned from the first session to the third. The winner got a bag of sweets.” (Session 3- observation notes)

The contests or games helped the students’ brain to activate and be alert in class. In the same way, it helped in the retention of words because the students would hear them again and again during the session.

Another BCA that was very helpful during this study was playing music in class. This was done during the time when students were not running around the room or doing something on the board. The music was played when the students

were preparing for their dialogues or their presentations. The researcher believes that it helped soothe the students' minds. Since they were all young adults and they obviously love music, it was a great way to divert their attention from the noise that each group was creating during the preparation. In the same way, it kept the energy that the students already felt from the start of the session. Initially, instrumental music was used but the students began to request a particular artist's songs. The teacher/researcher's choice of the instrumental music was based on the fact that this music does not have a vocal line, which could possibly distract the students. However, after receiving several student requests, the music was changed to give them the feeling that the teacher/researcher cared for them and would want them to feel at ease in class. The music they requested was what they wanted to hear. So those pop songs were played throughout all the sessions for this study.

To keep the fun and excitement going in class while the students were learning, the teacher/researcher also used some tricks like asking them to pick up their numbers to determine which group should present first. After they got their numbers, the teacher asked for a volunteer who would act like a director in a movie. That person should stay in front and after the presenters were called and they would be standing in front of everybody, the director should clap her hands and shout, 'action!'. The presenters would then start presenting.

“The music was turned on as the students went to their groups. It kept playing as they were preparing for their presentations. When they were ready, I turned the music off. Then, I took out the numbers and asked each group to pick one, to determine the group that would present first. This strategy added to the fun and alertness of the students in class

since they would always be interested to know which group got to be the first to present. It would make them excited to pick the numbers. Thus, this strategy was used all through the sessions.

Each group in class described the picture given to them. Each student prepared for something to say. I corrected their conjugation or pronunciation as they reported without making them embarrass. We made it fun by asking one of the students to act like a director and shout “action!” before each presentation begins. The students felt very comfortable to talk and they were not scared of committing any mistakes in grammar and pronunciations. I encouraged them to use the words they learned during the previous session and the new words they learned during this session in their presentations.” (Session 2 – observation notes)

As noted in the field notes during the second session, the teacher provided an immediate feedback by correcting the students’ grammar and pronunciation as they reported. This strategy helped not only those who were corrected but also those who were sitting down waiting for their turn to present. The students were not offended as the teacher did this way of correcting them. They could see that the teacher was not angry but only wanted the students to learn as much as they could.

Most of the participants of this study realized the importance of gaining the knowledge needed for their dreamed career in the future. The changes in their behaviors occurred as a result of their participation and cooperation in the activities provided by the teacher. They embraced the opportunity for creating a

meaning to the things they were learning and were trying to acquire. Those who remained passive during and after the study were those few who had personal problems. They could not come to class due to personal reasons like accidents and illness.

In conclusion, BCA affected the students' behaviors in class in a positive way. The students' learning atmosphere which included learning in a fun way and the favorable classroom environment contributed to the cooperation and participation of the students which led to confidence. As the students progressed in their learning, they became more confident in presenting their ideas without the fear of committing mistakes. The confidence they gained was the result of the BCA activities like the pair and group works, friendly classroom environment, and the teacher's amiable dealings with them. Moreover, the student-student interaction which was evident in the pair work and group work that the students did during this study, led to the positive relationship among the students and an increased self-esteem. Additionally, the teacher-student interaction became better as a result of the BCA done in class.

4.1.3 Research Question (RQ) 3: What are the students' reactions to BCA in learning vocabulary?

RQ3 was answered qualitatively using the data gathered during the class observation, the writings of the students in their diaries, and the semi-structured interview. It was found that the students have very positive and pleasant opinions and feelings about BCA.

In the teacher's observation notes, it was indicated that the students were having fun in learning vocabulary through the BCA activities. At the same time, they

learned the words and committed them in their memory because they had to read them and use them again and again. The repetition of the words through varied activities was very helpful in making the students learn and remember them.

Positive reactions

Most of the students had a very positive reaction to BCA when learning vocabulary. One of the reasons for this reaction could be the background of the students involved in this study. Most of them came from small villages where schools lack the modern facilities. Most, if not all, of them studied in a traditional classroom where the teachers would talk and they needed to sit and listen. Their teachers probably never allowed them to make comments or interact the way they did in this study.

Through the activities done in class and during the field trip, the students learned to use the words needed to describe the tourist place. The fun ways in which the activities were done helped in their vocabulary retention. As a result, the students became more responsible in doing what they were asked to do because they would like to become active learners.

The teacher's observation, students' diaries, and the interview support the students' positive reactions towards BCA.

“When the students entered the class, they were smiling, unlike the previous term where they seemed to ignore the presence of the teacher in class. They now acknowledge the teacher's presence and they seemed to have anticipated some good activities for this session. The students were more energetic in class and they were more participative when called to do a certain task.”

(Session 2 – observation notes)

“I did not like to study before, but it is very fun to study in this class and my friends are now friendly.” (S16)

“We are enjoying to study in this course.” (S22)

The students' positive reactions to BCA helped them learn the words presented to them and how to use them in sentences. However, not all of the participants reacted positively with BCA when learning vocabulary. During the informal talks with the teacher and the students, the latter revealed that they actually did not know the good things that the things they are learning would do to their life and their future since they still could not think of what to do when they graduate. So, as a respect to the teacher's effort in teaching them, they would just participate.

Moreover, in the teacher's observation and the student's diary, it showed that some students were a little lazy in class but they still tried to join in. Some were pre-occupied with other concerns or personal problems like being sick and recuperating from an accident. Yet they could see that their classmates were having fun in class, so they decided to have fun as well.

“During the on-site activity, some students were very active and enthusiastic to present the information to the tourists and they really knew what to say by heart. Some students had to carry a piece of paper with them and would glance every now and then because they could not remember well enough. Five students out of thirty-one did the glancing. According to them, they were willing to give descriptions and information but they did not have the time to practice what to say.” (Session 4 – observation notes)

“I forget some of the words but my friend help me to remember.” (S3)

In the case of S3, he rehearsed what he wanted to say during the on-site activity at Phanom Rung. Yet in his mind, he did not care that much because his friends promised to help him if he would forget, which he did.

Negative reactions

The negative reaction from the students was mostly about learning many words at the same time, since they had to understand and remember ten words per session. As S22 and S20 noted in their diaries:

“So many words to remember in every lesson. I get confuse sometimes and I cannot remember.”

“I am difficult to remember the words because they are many.”

There was no student who complained about the activities done in class other than the many words that they had to learn. While there were students who could not come to class in a session or two due to some minor accidents or illness, they would let the teacher know that they would be absent that day. Comparing to the previous term, these students would not care to let the teacher know what is happening around or why they could not come to class.

To sum it up, the students' positive reaction was very prevalent while learning vocabulary using the BCA. It was clear that their perception towards learning changed because of the activities done in class. Some students did not show any obvious reactions during this study. However, they would still participate in class. The teacher/researcher did not notice any student who reacted negatively on using BCA in learning vocabulary.

4.2 Summary

This chapter reports the results of the study and analyzes the data to answer the research questions posted for this research. The results show that the students' vocabulary knowledge increased significantly during the BCA implementation in the class. Moreover, they were able to retain the words they learned for a longer period of time. The students' behaviors changed positively as they underwent BCA learning. They became confident in presentations and in discussions using English. With the friendly environment they were in, they learned to like the course and their teacher. As a result, they would participate in every activity done in class and on the field. The self-esteem of those who were once shy also improved because of the better relationship among the students and the friendliness of the teacher.

The BCA done in class included pair work and group work which greatly helped in improving the relationship of the students who was once unpleasant. With the strategy used by the teacher wherein students cannot choose their own partner in the class activities or the members of their group, they were able to accept each other as part of the team. Other BCA that were very helpful during this study were the tricks used by the teacher in class, music, oral repetition, diary writing, the use of collaborative and cooperative techniques, maintaining a friendly environment, the use of colors, presentations, field trip, and feedback.

The next chapter will further discuss the results of this study. The importance of the study will also be shared including the limitations and the suggestions for further study.

CHAPTER 5

DISCUSSIONS AND RECOMMENDATIONS

This chapter further discusses the findings of the research done to see the effects of brain compatible activities (BCA) for vocabulary retention in English for Tourism. It uncovers the major findings of the study which include the classroom environment and the reactions of teachers and students to BCA. This chapter also deals with relating the findings of similar studies, pedagogical implications, and the conclusion.

This study was conducted with the third year undergraduate students in the Northeast of Thailand. These students are taking English for Tourism as one of the required foundation courses. Data for this study was gathered for a ten-week period during which the researcher taught the class using the BCA in the classroom for three sessions. The fourth session was done on-site where the participants acted as tour guides and another group of students from the same university (Bachelor of Arts, second year) were invited to be the tourists.

5.1 Major findings of the study

The findings of the study show that the students gained knowledge of the vocabulary during and after the BCA instruction. Support for this interpretation comes from the result of the tests given prior to class sessions and after it ended (Table 4.1). The result of the pre- and post-tests were significantly different statistically. This was

tabulated using the statistical measures and it was clear that the students learned some words and retained them in their long-term storage. The results of the immediate post-test, first delayed post-test and second delayed post-test show that some of the words that the students learned in class were still in their memories after at least for three weeks according to this study as shown in Table 4.3.

Additional findings for this study include the students' vocabulary learning and retention and their positive behavioral changes as a result of experiencing BCA in a friendly classroom environment. The underlying brain-learning principles that came alive in the BCA classroom were the reasons why the students' learning during this study was fun and effective.

5.1.1 Vocabulary learning and retention

The list of the words that the students studied in class with their corresponding scores before and after the lessons ended is shown below.

Table 5.1 The scores of each word used in BCA sessions

Vocabulary List	Scores in Pre-test	Scores in Immediate Post-test	Scores in Delayed Post-test 1	Scores in Delayed Post-test 2	Mean of Each word
extinct	11	26	24	18	19.75
archeological	13	26	14	10	15.75
commemorate	4	27	17	14	15.50
isolated	1	10	5	5	05.25
summit	4	10	8	7	07.25
gallery	9	25	23	17	18.50

Table 5.1 The scores of each word used in BCA sessions (continued)

Vocabulary List	Scores in Pre-test	Scores in Immediate Post-test	Scores in Delayed Post-test 1	Scores in Delayed Post-test 2	Mean of Each word
original	11	18	14	13	14.00
magnificent	7	29	22	21	19.75
craft	0	12	11	9	08.00
alley	1	5	3	3	03.00
annually	12	28	22	22	21.00
sanctuary	10	18	12	10	12.50
restore	2	11	10	6	07.25
attraction	14	25	23	20	20.50
replica	2	12	10	10	08.50
century	14	19	18	17	17.00
monument	11	24	22	19	19.00
pediment	7	24	20	20	17.75
lintel	5	17	14	12	12.00
sandstone	17	26	19	14	19.00
carved	5	19	17	14	13.75
arrangement	4	19	19	14	14.00
competition	12	22	18	12	16.00
excavate	10	20	15	12	14.25

Table 5.1 The scores of each word used in BCA sessions (continued)

Vocabulary List	Scores in Pre-test	Scores in Immediate Post-test	Scores in Delayed Post-test 1	Scores in Delayed Post-test 2	Mean of Each word
stairway	12	18	17	17	16.00
laterite	10	17	17	14	14.5
explore	4	13	12	7	09.00
itinerary	7	17	15	12	12.75
procession	11	19	18	17	16.25
region	2	8	7	4	05.25

Table 5.1 shows the words, the number of students who were able to recognize them prior to BCA instruction and after they attended the sessions, and the mean score of each word. It also shows the number of students who were able to remember the said words two weeks after BCA instruction ended or during the first delayed post-test as well as when they were tested for retention three weeks after that.

Some words used in this study were recognized by the students but some were not. Words like isolated, alley, restore, replica, craft, and region were new to most of the students based on the result of the pre-test. Among the thirty-one test-takers, only one student was able to recognize the word “isolated”, one student recognized “alley”, two students recognized “restore” and another two for “replica”, nobody knew the word “craft”, and two students knew the word “region” during the pre-test. After taking the course, the students showed some improvement in their knowledge of the words listed above. One reason for this could be that the words did not make any

impact on the lives of the students and they did not see the need of knowing them. It was possible for them to learn the words during the sessions because of the fun activities and remembered them after the sessions ended. However, not using them and not hearing about such words for a short period of time made them forgot easily. It could be that the meaning of the words and their usage did not sink into their long term memory just yet.

It can also be seen that the students' scores in the immediate post-test were higher which indicates the knowledge that the students gained during the BCA sessions. However, a decline of their retention can also be seen through their scores during the first and second delayed post-test respectively. Such decline could be attributed to the fact that they were not using the words in their daily undertakings and that they had no knowledge that they would be tested again. Additionally, it could also mean that the words taught in class which the students tend to forget did not reach to their long term memory since they have the difficulty in retrieving them after a period of time.

5.1.2 The effects of BCA to students' behaviors

The BCA done in class helped provide the better atmosphere among the students which led to gaining vocabulary knowledge and retention. Beginning with the class sessions where each one would get a glimpse of the things they would be studying for the day which confirms the brain learning principle stating that “the brain simultaneously perceives and creates parts and wholes” (2.2.2.6). As the learners anticipate the entirety of what they would be learning for the day, they were also creating expectations in their heads. Meeting such expectations or even exceeding

them was a challenge to the teacher since they might get bored if done otherwise, and which would hamper learning.

Repetition played a vital role in students' retention of the words taught in class. The more the students used the words in various activities, the more they stayed in their memories. Sprenger (2005:105) states that "long-term memories are networks of neurons that have been strengthened through repetition". As neurons would continually communicate with each other in various ways, retention would follow.

Emotion also affected the students' learning in different ways. The kind of emotion that flows to our brain would either inspire or suppress attention which would lead to effectively comprehend the lesson or completely turn away from it (Sprenger, 2005; Jensen, 2005). In this study, BCA sessions led to positive emotions among the students, towards their teacher and the course they were taking. These good emotions resulted from the friendly atmosphere they were in and the awareness of what they were learning as they connected it with what they wanted in their life. According to Sprenger (2005:22), "emotions and emotional states are patterns of response that lead to behavior". Since emotion affects our brain and entire body, providing good experiences could greatly help the students in remembering what they have learned.

Music was also used to facilitate emotional calmness and cooperation in the BCA classroom in this study. Sousa (2001:223) believes that music has a "therapeutic effects" to the listeners. The uneasiness and worries could be relieved by music. Sousa (2001:224) further explains that "music can stimulate the parts of the brain that are responsible for memory recall and visual imagery". That enlightened the good behaviors that the students showed when listening to the music in the BCA classroom.

It made them “stay focused” (Sousa, 2001:224) and felt comfortable especially because the songs being played were suited to their age and their style. It made them stay in the classroom even when they were done with their preparations for the presentation as compared to the previous term where they kept going out.

The classroom setting provided an interactive ambience to the students. The U-shaped arrangement of the chairs made them feel that they were important and that they needed to be seen. The use of the microphone helped the students be heard and everybody was able to listen to them as they spoke. It also served as motivation for the students to speak as properly as they could.

The contests and games done in class, the colorful power point presentations, and the repetition of words all contributed to the students’ retention of the words that they needed to use while learning this course. These were activities in the BCA classroom which confirm the twelve principles of brain-based learning by Caine and Caine (1994). With these activities, the students were able to recognize the words, remembered their spelling and usage and retained them in their memory because of the fun ways in which those words were associated during the sessions. Furthermore, they were tasked to use the words they learned in class in the actual setting where they got to act as tour guides themselves since “understanding the concepts behind the learning is essential” (Sprenger, 2005:64). They understood the meaning of committing those words to memory as they used them in describing the tourist place. They realized how important it was to know the words that their teacher taught them as they guided the students who acted as tourists and as they answered their questions. In addition, the students found meaning in what they were learning because they knew that they can use the information and vocabulary they were learning in their course to

become successful in their future career. These findings confirm the brain-based principle (2.2.2.4), which says that *the search for meaning occurs through patterning* and (2.2.2.8) *learning involves both conscious and unconscious processes* as the students repeated the words again and again in the activities. In this study, the students found the connection between learning the things and doing the activities in their real life.

The feedback given by the teacher to the students when they committed mistakes or when they were doing right was very helpful in their understanding of the course. Sprenger (2005:83) explains that “feedback as reinforcement offers encouragement and the opportunity to fortify what the students understand”. Feedback helped build-up the students’ comprehension and corrected their wrong assumptions before keeping such knowledge to their long-term memory. (Sprenger, 2005). It invigorated those who grasped the concept of the things they were learning while inspired those who needed reassurance and more support. It also served as a guide to the teacher in knowing which area of the course was understood and which one needed to be further reiterated.

5.1.2.1 The students’ learning atmosphere

Learning in a Fun Way

The positive classroom environment which was created during the BCA sessions contributed to the emotional experience of the students that led to their learning of the words and retaining them in their memory. As the students began to be at ease and familiar with each other, they became active and involved in their learning. The happiness and contentment of working with their peers activated the

students' prefrontal cortex which made the neurons in their brain send the message of feeling good. That made them comfortable with each other.

Favorable Classroom Environment

The BCA classroom has more peer interaction where pairs and group work are facilitated in every session. The teacher is present but is acting as a facilitator during the learning sessions. The teacher gives instructions on what to do and sets the mood of the students in learning by providing fun and challenging activities. Letting the students know what is happening in every session gives them the idea of what to expect. Additionally, keeping them lighthearted and in good mood leads them to positive attitude towards learning confirming two principles of the brain-based learning (2.2.2.5 and 2.2.2.11) which state that *emotions are critical to patterning and drive our attention, meaning and memory*, and that *learning is enhanced by challenge and inhibited by threat*. The students' cooperation and participation were encouraged in a friendly way like using tricks to make them present to the front first or counting off to create a group so they could not choose the members of the group they are in. In this way, they were given an opportunity to work with their classmates, even those they did not know that well. Thus, their relationship with each other became friendlier. Consequently, the class atmosphere became more conducive to learning since most of the students felt that their shyness was replaced with confidence. They were no longer afraid to make mistakes in front of their classmates because they know that each of them wants to help the others. This affirms Sprenger's words (2005:29) saying:

“Building relationships with students requires finding common ground. The more they feel they are like you or like each other, the more comfortable it is to develop relationships that will enhance learning.”

The teacher, as part of the learning environment, could be the initial source of friendliness, confidence, and encouragement. Added with BCA, these behaviors radiated to the students as they became attentive in learning this course, connecting it to their personal life. Once their emotional state was set, they continually tried learning more and enjoying the friendly atmosphere that was developing among them.

Cooperation and Participation

Everybody in BCA classes was given a chance to talk and to participate in the activities and in sharing their ideas. The students saw that the teacher was fair, flexible and tolerant in dealing with them, thus helping them to enjoy learning the course content. This encouraged them to do the tasks assigned to them without complaints believing that the teacher’s aims are for their own good. The brain learning principle that says *learning engages the entire physiology* (2.2.2.2) is confirmed since the students got themselves involved in games and other activities in class. Additionally, the students’ interaction with each other and with their teacher plus the acceptance that they felt could be the reasons why they became engaged and interested during the study.

Confidence

As a result of the fun learning in every session, the favorable environment and the students’ cooperation and participation in class, the students gained more confidence in expressing themselves. This could mean that the students

were challenged with the activities and thus engaged themselves in the situation they were in. This way, the brain-learning principle stating that *the search for meaning is innate* (2.2.2.3) is confirmed as the students became familiar with the things they were learning and realized the importance of these things in their own life.

5.1.2.2 The student-student interaction

Pair work and group work

Pair work and group work were effective activities during this study. The students enjoyed doing it most of the time. This activity was the usual time for them to discuss things with their friends and present whatever the result of that discussion would be. This activity confirms the brain learning principle which states that *the brain is a parallel processor* (2.2.2.1) because the students were able to use their different faculties in their bodies to be able to prepare for their presentations. Like for example, listening to their friends and writing such information at the same time, as well as remembering them as they face the class during presentations.

Positive relationship with each other

As a result of the activities in class, the students became closer to each other wherein they could then be open with their ideas and opinions about things without holding them back. This better relationship helped them not to be shy during presentations. This confirms the brain learning principle which states that *emotions are critical to patterning and drive our attention, meaning and memory* (2.2.2.5). The students' good attitude towards each other possibly led them to learn better during this study.

Increased self-esteem

The students' positive behaviors which led to having a harmonious relationship in class further increased their self-esteem. One of the brain learning principles states that *each brain is unique* (2.2.2.12) is confirmed with this result where previously shy students suddenly felt accepted within their own group and started being comfortable with their fellow students.

5.1.2.3 The teacher-student interaction

Learning is enhanced by challenge and inhibited by threat (2.2.2.11) is the brain learning principle that was confirmed in this result. Since the teacher respected the students' opinions and their individual differences, the former eased up in class. As the teacher realized the uniqueness of every person's brain, pursuing the activities in class that would help the students in finding meaning for what they were learning since *the search for meaning occurs through patterning* (2.2.2.4), they acknowledged such effort as shown in their change of attitude towards their teacher and their fellow students.

5.1.3 Reactions of teachers and students to BCA

Positive reactions

The study shows that teachers and students have equally pleasant reactions to BCA. As noted in the fourth chapter of this paper, the students used to be indifferent towards each other and towards their teacher in the previous term. Such indifference resulted to less participation in the class, less unity and non-cooperation among the students. With BCA, the students learned to accept each other as individual learners. Their relationship towards each other improved and became better as they interacted

during the classroom activities. They became more cooperative, participated and more eager to do the activities during the sessions.

The teacher was pleased with the friendly and active behaviors of the students, beginning from coming to class on time to becoming attentive during presentations. There was no whining even when they were not able to stay with their close friends during the group work or the pair work as the teacher decided to randomly group them using games and/or tricks.

Moreover, the students developed a sense of confidence in using what they have learned and in expressing themselves. They became alert in class knowing that the information they will be learning was necessary for their success in the future. In connection with this, their willingness to learn improved.

Gathering more positive results of students' behaviors in this study could be the result of the fun ways and the respect that the teacher gave the students. Furthermore, these learners came from the remote places of the Northeast province where teacher probably never gave them the chance to stand up and participate freely and actively as the teacher in this study did.

Negative reactions

The BCA done in class was embraced by the students with willingness and anticipation. Thus finding no negative response could not be that surprising. However, they complained about the many words that the teacher asked them to read, learn and remember during the course of this study.

It could be that the students found the meaning of the things they were doing in class as they participated in since *the search for meaning is innate* (2.2.2.3) as stated by the brain learning principles by Caine and Caine (1994). In so doing, they

perhaps remembered the fun and enjoyable things more than the things that made them unhappy during this study.

In summary, the activities during these sessions helped the students to be comfortable and relaxed as they moved around the classroom. The increasing friendliness among each other, the teacher's encouraging feedback, the fun games and activities all contributed to their positive emotional state. Their creativity and motivation were enhanced as a result to giving them the responsibility to work in pairs, in a team and as an individual. Overall, learning occurred due to the pleasantness of the students' atmosphere coupled with the awareness of what they are trying to learn and to become. Learning the words in a fun and lighthearted way made the knowledge to sink into the students' brains since their emotional state lead them to experience something meaningful (Jensen, 2005).

The diagram below summarizes the results of the implementation of BCA in the classroom.



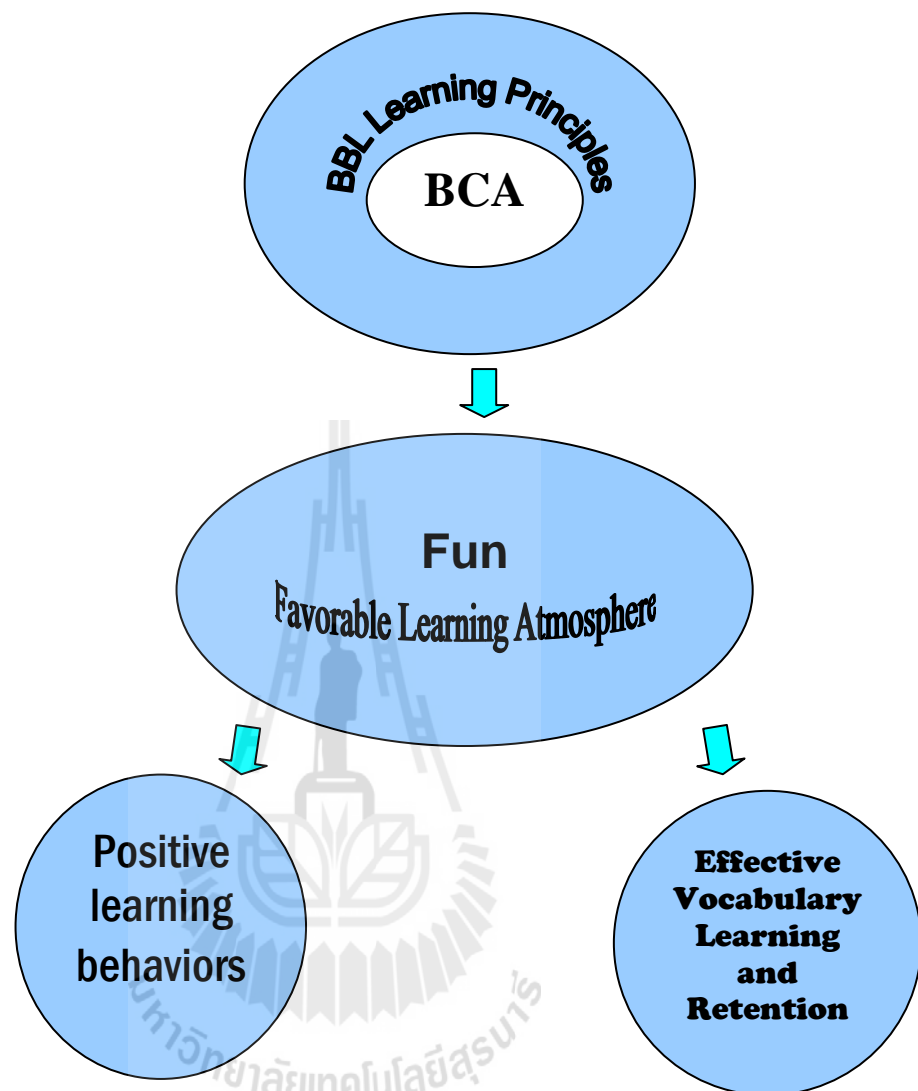


Figure 5.1 BCA – Learning in action

This diagram shows that BCA, which were based on the brain-based learning principles by Caine and Caine (1994), made learning fun and effective like the games, classroom-setting, and presentations among others. These effects led to the students' positive attitude towards the course they were learning, towards their teacher, and towards their classmates. Ultimately, the positive changes of the students' behaviors led to vocabulary learning and retention.

5.2 Relating findings to similar studies

The result of this study shows congruency in the other studies done in the field of brain-based learning and vocabulary retention (Bayindir, 2003; Yek, 2006). These studies supported the positive effects of brain-based learning to the attitude of the students towards learning and for vocabulary acquisition and retention. Similarly, the present study indicates positive behavioral changes and confidence improvement after undergoing BCA instructions.

Chang (2004) made a study on brain-compatible vocabulary learning strategy instruction (BVLSI) applied to 115 fifth graders at Municipal Senior High School in Taipei. In this study, it was found that positive learning environment produces good outcomes. Learners became interactive as they were encouraged to actively participate in the class. With the teacher's guidance, the learners actively engaged in the tasks and thus learned a lot during this study. This shows that a favorable learning environment is very important for the students to gain the knowledge they needed. In the same way, the present study made use of the friendly learning environment, making it conducive to obtaining understanding between the teacher and the students.

Pennington (2010) conducted a study on brain-based learning theory: the incorporation of movement to increase the learning of grammar by high school students. There were 277 secondary students who joined the study. They were in grades 9-11 and were enrolled in College Prep English courses. There were fifteen grammar lessons which lasted for around 15 minutes for each participant. There were 15 lessons that were done for five weeks. The major findings of the study showed that the students engaged in the activities done in class and they enjoyed them. However, the result showed that the treatment was ineffective. The author cited the factors for

the ineffectiveness of the study as follow: short length of time in doing the research, make-up work and absenteeism on the part of the students, too many instructors involved in teaching who probably used their own unique methods, and the awareness of the teachers and the students about the study. Unknown factors about the brain and the degree necessary for significant learning may have also caused the lack of statistical significance of the study. Comparably, the present study showed positive results in the students' learning as the effects of the pleasant feelings while taking the course. The lone teacher facilitating the study may have triggered such good response from the participants making the activities effective.

5.3 Pedagogical implications

The findings of this study suggest that brain learning is effective not only with the children but with the university students as well. The BCA done in the classroom could be helpful for the teachers who are open to challenges and are motivated to create different strategies with the aim of helping the students achieve their full potential in learning a language. The teacher's role in this approach is more of a facilitator. Students in BCA classrooms are encouraged and guided to be more cooperative and be more interactive as quoted in Jensen (2000:115):

If the learner is confident, learning increases.

If the learner believes in the teacher, learning increases.

If the learner thinks the subject is important, learning increases.

If the learner believes it will be fun and valuable, learning goes up!

The key factors in enhancing positive learning behaviors among the students include the teacher's good attitude towards the course being taught and towards the

students, the conducive-to-learning environment, the fun activities in class, and the real-life importance of the content that the students are learning. These helped the students gain more knowledge in their own terms because they believed that they needed to learn in order to be successful in their chosen career. These further led the students to become more interactive in class knowing that they were free to express themselves in a productive way.

5.4 Limitations of the study

This study has some limitations. Firstly, the students did not react immediately to BCA because they were used to be given everything in class in a lecture-style method of teaching. As observed in the beginning of the study, the students were very hesitant to give themselves the chance to open up since most of them came from the remote areas of the province and they were not used to being given the chance to speak individually in front of their peers mostly because of the number of students in every classroom in public schools. They only started showing more interest in the sessions that followed. However, the study was limited to only four sessions and there is not much time for the students to further exercise what they have achieved during this study. Lastly, different students have different levels of motivation to come to class and learn new words. Although the teacher dealt with the students' tardiness and absences positively and had encouraged them to come to class on time regularly, more attention should have been given to those students who seemed different from the others. Therefore, further studies and innovations will be recommended to get better results in the future.

5.5 Suggestions for further research

This study was conducted with a group of students from Buriram Rajabhat University in the Northeast of Thailand. Further study is therefore recommended using the brain-based learning principles. Topics can vary from vocabulary acquisition and retention, writing composition skills development, and enhancing speaking using music as a tool. Different areas of research can be focused on, like learning a foreign language, English for specific purposes, or retaining information in long-term storage using the first language of the learners as the language of teaching.

Additional suggestions in conducting a research related to the current study is that questionnaires can be given to the students at the end so that they would be able to assess their own learning and their behavioral changes as they see fit. They could also be asked about their own opinion or the students' feedback about the lessons and the entirety of the study without giving them any hint or any lead.

5.6 Conclusion

The positive effects of brain compatible activities (BCA) for vocabulary retention in English for Tourism were very useful in the teacher's and students' life as a whole. The experiences that the students gained during this study not only helped them gain more confidence in expressing themselves but also led them to change their behavior towards the lessons they were learning, their teacher, and their peers. While there were factors that caused limitations for this study, it can be concluded that BCA was extremely useful in finding a meaningful way of teaching and learning that could develop the students not only in the academic world but in the totality of their beings since they were able to realize that there is more to learning than their individual self.

Realizing the power and creativity that would come from different brains, the students became closer to each other which created a harmonious relationship among them. Further, the teacher's acceptance and understanding of the individual student led them to like the lesson more and become attentive because such treatment led to creating a connection between the teacher and the students. In conclusion, the results of this study opened the eyes of the researcher to other improvements needed in the field of teaching. Thus, the use of the brain-based learning approach was recommended for further study in some areas of teaching and learning that needed to be developed with the aim of helping the students achieve their potential.



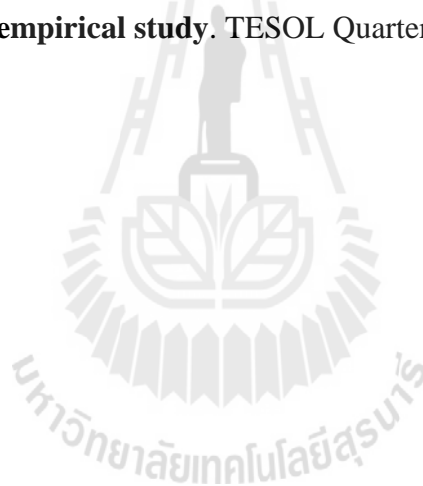
REFERENCES

- Baddeley, A. (1997). **Human Memory: Theory and Practice**. Hove: Psychology Press.
- Baddeley, A.D., Hitch, G.J. and Allen, R.J. (2009). **Working memory and binding in sentence recall**. *Journal of Memory and Language*, 61 , 438-456.
- Bayindir, H. (2003). **An investigation of students' attitudes towards brain-based applications in English Composition Skills II course: A case study**. A Master's thesis. Middle East Technical University.
- Bransford, J.D., Brown, A.L., and Cocking, R.R. (2000). **How people learn; brain, mind, experience and school (expanded edition)**. National Research Council, National Academy Press. WA, DC: USA.
- Caine, R. N., & Caine, G. (1997). **Mind/Brain learning principles**. New Horizons for Learning. WA:USA.
Available at <http://www.newhorizons.org/neuro/caine/htm>.
- Caine, R. N., & Caine, G. (1994). **Making connections: Teaching and the human brain**. Menlo Park, CA: Innovative Learning Publications.
- Chang, S. (2004). **A Brain-compatible vocabulary teaching strategy applied to underachieving students**. A Master's thesis: Ming Chuan University.
- Duzel, E., Cabeza, R., Picton, T.W., Yonelinas, A., Scheich, H., Heinze, H., and Tulving, E. (1999). **Task-related and item-related brain processes of memory retrieval**. *Proceedings of the National Academy of Sciences of the United States of America*.

- Erlauer, L. (2003). **The brain-compatible classroom: Using what we know about learning to improve teaching**. Association for Supervision and Curriculum Development (ASCD). VA: USA.
- Hart, L. (1999). **Human Brain and Human Learning**. WA: Books for Educators.
- Howard-Jones, P. (2010). **Introducing neuroeducational research: Neuroscience, education and the brain from contexts to practice**. Routledge.
- Jensen, E. (2000). **Brain-Based Learning**. Del Mar, Calif.: Turning Point Publishers.
- Jensen, E. (2005). **Teaching with the Brain in Mind**. Alexandria, Va.: ASCD.
- Khaimook, K. (2004). **Item Analysis System**. Loma Soft Co., Ltd.
- Lin, M. (2010). **The effects of whole language approach and brain-based learning instruction on students' GEPT test performance**. A Master's thesis. National Yunlin University of Science and Technology. Taiwan, Republic of China.
- Marchese, T. J. (2002). **The new conversations about learning: Insights from neuroscience and anthropology, cognitive science and workplace studies**. New Horizons for Learning. WA:USA. Available online: http://www.newhorizons.org/lifelong/higher_ed/marchese.htm
- Marzano, R.J. (2004). **Building background knowledge for academic achievement: Research on what works in schools**. Alexandria, VA: Association for Supervision and Curriculum Development.
- Nation, P. (2001). **Learning vocabulary in another language**. Cambridge University Press.
- Ormrod, J.E. (2003). **Educational psychology: developing learners (4th ed.)**. Upper Saddle River. NJ: Prentice Hall.

- Paivio, A., & Csapo, K. (1973). **Picture superiority in free recall: Imagery or dual coding?**. *Cognitive Psychology*, 5, 176-206.
- Pennington, E.P. (2010). **Brain-based learning theory: the incorporation of movement to increase the learning of grammar by high school students**. Doctoral Dissertation. Liberty University. VA: USA.
- Perry, B. D. (2005). **How the brain learns best**. Scholastic. Retrieved February 11, 2010. from <http://teacher.scholastic.com/>
- Pikulski, J. and Templeton, S. (2004). **Teaching and developing vocabulary; key to long-term reading success**. Houghton Mifflin Company.
- Read, J. (2000). **Assessing Vocabulary**. Cambridge University Press
- Schmitt, N. (1997). **Vocabulary learning strategies**. In N. Schmitt & M. McCarthy (Eds.). *Vocabulary: Description, Acquisition and Pedagogy*. Cambridge University Press, pp. 199-227.
- Sculley, J. (1992). **Remarks by John Sculley**. Consumer' Electronics Show. Available at www.thefreelibrary.com.
- Sokmen, A. J. (1997). **Current trends in teaching second language vocabulary**. In N. Schmitt and M. McCarthy (Eds.). *Vocabulary: Description, Acquisition and Pedagogy*. Cambridge University Press.
- Sprenger, M. (2005). **How to teach so students remember**. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).
- Sprenger, M. (1999). **Learning and Memory: the brain in action**. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).
- Sousa, D. (2001). **How the brain learns: A classroom teacher's guide**. Thousand Oaks, CA: Corwin.

- Tompkins, A. W. (2007). **Brain-Based Learning Theory: An Online Course Design Model**. Doctoral Dissertation. Liberty University. VA: USA.
- Willis, J. (2008). **Teaching the Brain to Read. Strategies for Improving Fluency, Vocabulary, and Comprehension**. Alexandria, VA: ASCD.
- Wolfe, P. (2001). **Brain matters: Translating research into classroom practice**. Alexandria, VA: Association for Supervision and Curriculum Development.
- Yek, S. (2006). **Memory-enhancing vocabulary learning strategy instruction**. A Master's thesis. Ming Chuan University.
- Zimmerman, C. (1997). **Do reading and interactive vocabulary instruction make a difference? An empirical study**. TESOL Quarterly. 31 (1): 121-40.



APPENDIX A

Information about Phanom Rung

(for readers only)

The Phanom Rung Sanctuary is one of the most beautiful and important Khmer historic sites in Thailand. It was built during the 12th century A.D. and is set at the summit of Phanom Rung Hill in Tambon Ta Pek, Chaloem Phra Khat District, Buriram Province. Phanom Rung is the original name and is mentioned in stone inscriptions excavated in this area. It is a religious sanctuary dedicated to the God Shiva, the supreme Hindu deity. It symbolizes Mount Kailasa, the heavenly abode of Shiva. It has been designed to emphasize the central building, the principal tower, which faces east.

To the right of the stairway leading to the tower is a building known as "phlab phla" (robbing room) in which the King would make preparations prior to proceeding with his entourage to pay respect to the deity or to perform religious rites. Near the robbing room is the pathway which has 38 columns (called "sao nang rieng") topped with lotus buds on both sides. The pathway leads to the raised cruciform-shaped naga bridge which has rails in the form of a five headed naga (a mythical snake). It is believed that this bridge links the human with the heavenly realm. In the middle of the bridge is an engraving of an eight-petalled lotus which could symbolize the deities of

the eight directions in Hindu belief. It could also mark the point where propitiation ceremonies were performed or where pilgrims made vows before proceeding further.

At the end of the naga bridge are 52 steps leading to a plateau on top of the hill. To the front of the arched doorway in the eastern gallery 1 is a second naga bridge. The gallery is actually a rectangular structure surrounding the tower on all four sides. It is not possible to walk through the gallery, however, as it is blocked in sections by a wall. In the center of each wall is an arched doorway, while the corners of the wall are cruciform. The external gable on the eastern wall carries a relief of Shiva in the manifestation of a healer. This could represent Narendradit who constructed the Sanctuary.

The main tower, which is square, was constructed using pink sandstone. The building is 9.20 meters wide and 23 meters tall. The front section is a rectangular chamber {mandapa) with a connecting corridor. It is believed that the principal tower was constructed by Narendradit, who ruled over the community where Prasat Phnom Rung is located during the 12th century A.D. The most sacred religious object, in this case the Shiva Lingam, was enshrined in the center of the tower. It is most unfortunate that this sacred object of art has now disappeared and all that remains is the water conduit to receive the water poured over the lingam.

There are two stone towers and a minor tower to the northeast and the southwest of the principal tower. Archaeological evidence shows that these predate the main tower and were constructed in the 10th and 11th centuries A.D. In front of the tower, to the northeast and the southeast, are two late rite buildings known as "banalai" (scripture

repositories or libraries) where sacred religious texts were stored. These buildings were constructed in the 13th century A.D. The principal tower is adorned with gables and lintels carrying relief depicting episodes from Hindu legends such as the dancing Shiva, Vishnu in the reclining position, and manifestations of Vishnu in the form of Rama, in the epic Ramayana, or Krishna. There are also relief of religious ceremonies and daily activities of hermits.

Sources of information:

<http://isan.sawadee.com>

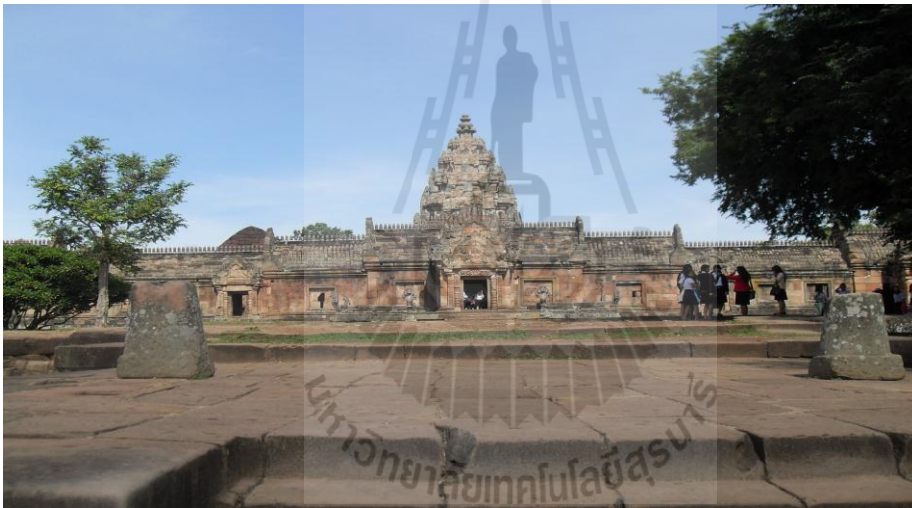
http://www.sundial.thai-isan-lao.com/phanom_rung.html



APPENDIX B

Pictures of Phanom Rung Stone Castle

Note: *The pictures posted here were mostly taken during our field trip to the castle. They were posted as additional information for the readers. Some pictures that were taken from websites show indication of their sources.*



The pathway
leading to the main
temple.



The columns along the pathway.



The robbing room.



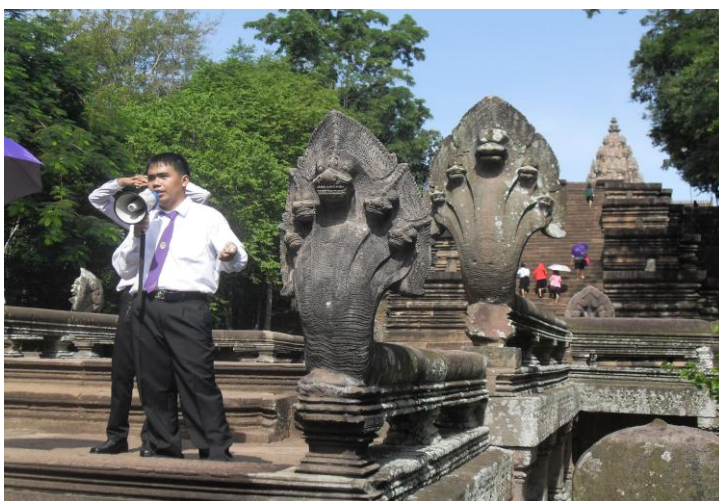
Another view of the robbing room.



Some pillars inside the robbing room.



The laterite and sandstones used in the construction of the temple.



The tour guides and five-headed nagas at the Naga bridge. A Naga is a mythical snake.



The Naga bridge, connecting the ground (earth) to the temple (heaven).



The eight-petalled lotus at the Naga bridge.



The stairway leading to the main tower of the temple.



Front view of
Phnom
Rung
Sanctuary.



The main tower of Phnom Rung
Sanctuary.



An example of a lintel
and a pediment.



The dancing Shiva. An example of a pediment found at Phanom Rung Sanctuary.



Vishnu is depicted reclining on the Ananta serpent on the Ocean of Milk. A lintel at Phanom Rung Sanctuary.



The depiction of Defloration Ceremony.



The other library that faces the east.



A closer look at the library where the religious books and objects were kept.



The guard at the central tower made from sandstone. Inside is the Shiva lingam, believed as a symbol of life in Hinduism.



The central tower



The Shiva Lingam



The replica of the Nandin facing the 5 rishi, the lingam and the sunset.



Five *rishis* (hermits) in the inner chamber sitting in a meditative posture.

Available at

<http://www.sundial.thai-isan-lao.com/>

The puranatanyaka ceremony. A ceremony for agriculture and abundance.



Available at <http://www.sundial.thai-isan-lao.com>



Phanom Rung
traditional
festival

Available at www.loupiote.com.



The lights and
sounds presentation
during the Phanom
Rung festival.

Available at www.aonangkrabi.net



The sun shines through the 15 doors.

Available at [www.](http://www.holidaysinThai.blogspot.com)

[holidaysinThai.blogspot.com](http://www.holidaysinThai.blogspot.com).

APPENDIX C

BCA Sample Lesson Plan

Lesson 1: Phanom Rung

STEPS	ACTIVITIES/PROCEDURE
<p>Orchestrated immersion</p>	<ul style="list-style-type: none"> → Ask the students to change the seating arrangement into U-shape. Have them do some stretches. → Ask questions about the tourist attraction in Buriram and which one is the most famous. → Ask if they have visited the place already (depending on answers) → Let the students know what the lesson is and how important it is to know it → Present the words using Power point presentations and pictures

Purpose: → To set the students' mood in studying and let them grasp the idea of what they are learning for the day

Brain-based principles:

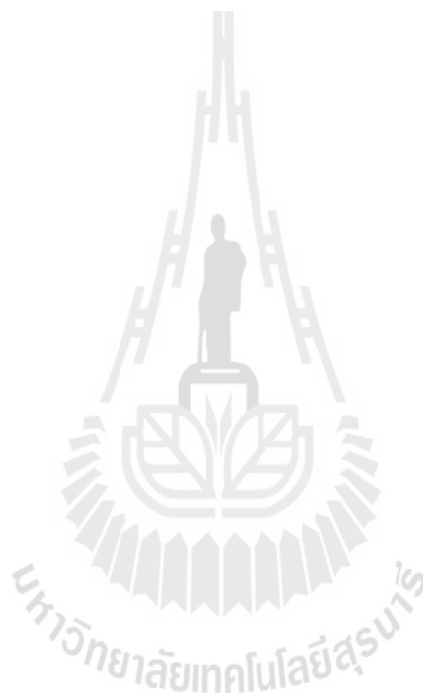
- The search for meaning is innate.
- Learning involves both focused attention and peripheral perception.
- The brain simultaneously perceives parts and wholes.
- Emotions are critical to patterning and drive our attention, meaning and memory.

<p>Relaxed alertness</p>	<ul style="list-style-type: none"> → Divide the students into groups and have them play a spelling game. Each member of the group who loses has to use a word in a sentence. → Tell the story of Phanom Rung → Get the students' attention towards the story by giving them a smiley face attached to a stick. Once they hear the word that the teacher presented today, they have to raise the smiley face. The teacher will then allow the students to say the word out loud.
<p><u>Purpose:</u> → To be able to use the words in the sentence correctly → To take the students' attention towards learning about Phanom Rung and connecting them to their real life</p>	
<p><u>Brain-based principles:</u></p> <ul style="list-style-type: none"> → Learning involves both focused attention and peripheral perception. → The search for meaning occurs through patterning. → Emotions are critical to patterning and drive our attention, meaning and memory. → Learning is enhanced by challenge and inhibited by threat. → Learning engages the entire physiology. 	
<p>Active processing</p>	<ul style="list-style-type: none"> → Play the game that would lead to creating pairs among the students → Tell each pair to prepare a dialogue and present it in class. The teacher gives an example of the dialogue. Students should be able to use most, if not all, of the words presented in class today. → Music will be played as students are preparing for their dialogues → Ask each pair to pick a number as the teacher walks around the room to determine who presents first.

Purpose: → To practice the language and the words that the students learned in class

Brain-based principles:

- Learning engages the entire physiology.
 - The brain is a parallel processor.
 - We understand and remember best when facts are embedded in natural, spatial memory.
 - Learning is enhanced by challenge and inhibited by threat.
-



APPENDIX D

The 30 words used in lessons and in the post-tests

extinct	archeological	commemorate
isolated	summit	gallery
original	magnificent	craft
alley	annually	sanctuary
restore	attraction	replica
century	monument	pediment
carved	sandstone	lintel
arrangement	competition	excavate
stairway	laterite	explore
itinerary	procession	region

CURRICULUM VITAE

Ms. Lilibeth Lago has been teaching for almost fifteen years. She finished her Bachelor's Degree of Elementary Education in Bukidnon State University in the Southern part of the Philippines. She used to work with the deaf children and adults in the Philippines for eight years. She helped organize the pioneer school for the deaf, Welcome Home School for the Deaf, in the city of Malaybalay, province of Bukidnon (Philippines). She came to Thailand in 2004 and started teaching the undergraduate students at Buriram Rajabhat University, in the Northeast of Thailand. It was there where she realized the need to learn more in order to be able to reach out to the students. Suranaree University of Technology offered the answers to her questions and provided the tools to make teaching fun and effective. These are some of the reasons why she decided to pursue her master's degree in this prestigious university. Her special interests include designing courses, curriculum development, and computer literacy.