

## **Enhancing Vocabulary Acquisition and Retention Through the Brain-Based Learning Strategies**

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**Abstract:** The aim of this study was to assess the effectiveness of the Brain-based Learning Approach in enhancing vocabulary acquisition and retention among Year 4 pupils in a primary school. The strategy implemented was based on Brain-Based Learning Principles. The goal of Brain-based education is to make the utmost use of the situations in which the brain learns the best. Hence, it can be said that brain-based learning in the classroom demonstrates an innovative approach which enhances positive learning conditions for school children. Vocabulary acquisition is an important component in second language acquisition, and it becomes more meaningful when retention of the words learnt is maximized. Embedding brain-based learning strategy in teaching and learning provides opportunity for better vocabulary acquisition and retention, at the same time, increases the level of motivation among young learners. A descriptive quantitative design was used in this study involving 33 pupils from a primary school in Batu Pahat, Johor. The pupils had average to above average English language proficiency and were randomly allocated in the control group and the experimental group. The control group had undergone traditional approach to learning vocabulary while the experimental group experienced learning which encompassed brain-based learning approach. The pupils in both groups underwent a pre-test, post-test and delayed post-test. Data derived from these tests were analysed and tabulated for mean and percentage. The independent t-test showed significant difference in vocabulary acquisition and retention among pupils in both groups. It was found that pupils who followed the brain-based teaching approach attained better vocabulary acquisition and vocabulary retention compared to the pupils who were exposed to traditional teaching methods.

**Keywords:** Brain-based Approach, Vocabulary Acquisition, Vocabulary Retention, Second Language Acquisition

## **INTRODUCTION**

English has been a compulsory second language subject in both primary and secondary schools in Malaysia since the 1960's (Asmah Haji Omar, 1992). In 2000, the Malaysian University English Test (MUET) was introduced as a proficiency assessment tool and was made a requirement for admission into local universities by the Malaysian Examination Council (Souba & Kee, 2011). More recently, the Common European Framework of Reference (CEFR) was introduced in the Malaysian education system with the establishment of the English Language Standards and Quality Council (ELSQC) in 2013. In addition, a roadmap outlining the long-term goal and plan from 2013 to 2025 to provide the best language education starting from pre – school up to tertiary education was also introduced. Despite such efforts, English literacy was reported to have dropped since 2014 (<https://www.humanresourceonline.net>, 2014) despite the importance given to second language learning in education. In addition, the former Minister of Education, Tan Sri Muhyiddin Yasin commented on the poor command of English, especially in speaking and writing, among graduates in Malaysia which eventually leads to non-employability (The Malay Mail, 2014). To address this issue, it was important to investigate certain aspects in second language learning that may have contributed to this issue. One of which is the vocabulary or lexical competence which promotes better speaking and writing ability. Therefore, it is difficult to deny the importance of vocabulary acquisition in all aspects of language learning.

It is also important to look at the Malaysian English Language curriculum. The Modular approach is used in Malaysia Primary School Standard Curriculum (KSSR being its acronym in Malay Language). According to the official standard document for KSSR published by the Curriculum Development Department of the Ministry of Education, primary education is divided into two stages: Stage One refers to Year 1, 2 and 3 and Stage 2 refers to Year 4, 5 and 6. In the case of English, there are four modules in Year 1 and 2; Module 1 (Listening and Speaking), Module 2 (Reading), Module 3 (Writing) and Module 4 (Language Arts). As for Year 3 to Year 6, grammar is added to the above list of four modules as the fifth module. The modular approach clearly shows that teaching vocabulary is not separate like the other modules previously mentioned and should be embedded in lessons explicitly or implicitly by the English language teachers.

As such, language teachers must make consistent effort to enrich students' vocabulary while fulfilling the task of concurrently teaching the other skills. One of the most prevalent problem faced in teaching vocabulary is the difficulty students face in using and retaining newly acquired words. In recent years, a growing number of new approaches have been used in English Language classes to enhance students' participation and acquisition (Yagcioglu, 2014). Hence, the teaching of vocabulary also needs to evolve - moving away from the traditional method of copying and remembering to something more effective and meaningful. According to Thomas and Swamy (2014), meaningful learning occurs when there is a shift from teacher-centred educational settings to a learner-centred environment in which the learners' roles are maximised through the minimisation of teachers' dominance. Learners' involvement and engagement in the materials taught is a direct result of meaningful learning that teachers adopt.

Thus, this study aims to examine the effectiveness of learning vocabulary through the implementation of a brain-based teaching strategy to promote better acquisition and retention

among students. Brain-based learning refers to teaching methods, design of lessons, and school programs that are constructed based on the findings of the latest scientific research on how the human brain learns, the brain's structure and its functions.

In addition, the Brain-based approach requires educational environments that provide students with the opportunity to experience activities that are well-suited with the brains' natural way of learning which will enhance students' motivation to learn, succeed and think creatively (Ashraf Atta, 2017). Hence, Brain-based approach is a way to generate a learning environment that enhances student's learning while concurrently improving academic progression.

In the Malaysian education context, the Brain-based approach has been used in the teaching of different subjects at different levels. The principles of the Brain-based approach have been applied in the teaching of primary school pupils with delayed reading development or slow reader students (SRS) (Abidin et al. 2017). In addition, studies have also shown the application of the Brain-based approach in teaching Physics (Saleh and Subramaniam, 2019) and Additional Mathematics (Mohd Yatim, Saleh, Mohd. Yatim and Zulnaidi, 2020) to students in Secondary schools. Other studies (e.g. Wan Ali, 2018) have reported the use of the Brain-based approach to teach students at higher education. However, in the context of English Language teaching, particularly in the teaching of vocabulary, there appears to be a scarcity of study on the use of Brain-based approach in ESL classrooms. Hence, more research documenting the implementation of the Brain-based approach in Malaysian schools is needed. In the ensuing sections, relevant key studies that form the foundation of this study will be discussed.

## **LITERATURE REVIEW**

### **Brain-Based Education**

Caine and Caine (1994) defined Brain-based learning as "... acknowledging the brain's rules for meaningful learning and organizing teaching with those rules in mind" (p. 4). In addition, Brain-based education is "...learning in accordance with the way the brain is naturally designed to learn" (Jensen, 2000:6). Educators and psychologists such as Caine and Caine (2002), Jensen (2005, 2008), and Sousa (2016) are key scholars and champion of the Brain-based learning movement.

The Brain-based approach is based on the understanding that each portion of the intelligence has an explicit function when related to learning (Lombardi, 2008; Saleh, 2012). Taking into consideration that all learners store and retrieve information differently, it necessitates that teachers use their understanding of how the brain absorbs new knowledge and adopt a brain based approach when choosing teaching strategies (Lago & Seepho, 2012; Sun, 2012). Tate (2013) views teachers as cultivators of dendrites and synapses should be aware of how students acquire and understand information. Tate synthesized 20 instructional strategies; for example brain storming, discussion, graphic organizers, visuals, humor, role play, movement, music, story-telling, manipulatives and technology; that would support brain-based learning.

In fact, Brain-based learning enhances students' learning through challenge and uninhibited threat. The approach provides challenging, but achievable tasks to motivate students to strive (Ashraf Atta, 2017). Thus, the goal of Brain-based education is to maximise environments in which the brain learns best. In fact, Kieran O'Mahony (2020) in his book *The Brain-Based Classroom* discussed in length how an understanding of neuroscience via an application of brain centric strategies will enable teachers to tap into every learner's full potential.

## **Principles of Brain Based Education**

There are twelve fundamental principles of brain-based education which are described as its teaching and learning directorial principles which will also be adopted in the current study (Caine & Caine, 1991; Caine, Caine, McClintic and Klimek, 2015). The twelve principles are outline in Table 1.0.

**Table 1.0:** Twelve brain-based learning principles (Caine & Caine, 1991; Caine et al., 2015)

1. The brain is a complex adaptive system.	7. Learning comprises both attentive devotion and outlying insight.
2. The brain is a social brain.	8. Learning always involves both conscious and unconscious processes.
3. The search for meaning is distinctive.	9. Learning always takes place in two memory approaches; spatial and rote
4. The exploration for meaning occurs through imitating.	10. Learning is embryonic.
5. Emotions are critical to patterning.	11. Complex education is improved by challenge and reserved by threat.
6. Every brain concurrently identifies and designs slices and totalities.	12. Every brain is uniquely organized.

The twelve principles of brain-based learning outlined in Table 1.0 were adopted in constructing activities in the lesson plans used in this study. However, not all twelve principles as listed in Table 1.0 were used, only a selection of principles was adopted as this is sufficient for the three treatment sessions planned in this study. In addition, a supportive emotional climate was created through constant communication and monitoring of pupils during the activities. In order to ensure the vocabulary items were best understood and effectively grasped, students were engaged in both verbal and visual experiences during the lessons.

### **Key Elements of Brain – based Learning Principle**

Apart form the twelve principles, the strategies used revolved around the following three fundamental instructional methods related to the brain-based learning (Caine et al., 2015): relaxed alertness; orchestrated immersion; and active processing.

#### **i. Relaxed alertness**

It is an optimal state of mind, comprising low threat and high challenge. A state of mind that should be created in brain-based classrooms, so students can attain levels of higher order thinking. Findings from previous research show that a number of learning is positively affected in a relaxed situation, but at the same time, it is curbed when threat and fatigue are sensed (Caine et al., 2015). To create this state in a learning atmosphere, teachers are encouraged to provide a low threat and relaxing environment while presenting a noteworthy challenge to learning (Ashraf Atta, 2017). In other words, the presence of relaxed alertness allows students to feel comfortable, which eventually engages them emotionally in learning the content taught. In this study, a state of relaxed alertness was created by providing students a chance to work in groups when conducting activities such as role play.

## **ii. Orchestrated immersion**

The term orchestrated immersion implies that the teacher takes on the role of an orchestrator or an architect who designs experiences that allow students to make meaningful connections by creating a learning environment that immerses learners in a learning experience (Caine & Caine, 2002). In other words, it can be defined as students' concentration on the content they learn. Caine and Caine (1994) defined orchestrated immersion as a process which puts an end to chalk and talk classroom style to something more realistic, and lively which stays vivid in the students' mind.

## **iii. Active processing**

Information is consolidated and internalized by learners through active processing and at the same time, it should be regarded as a focus on meaningful learning rather than memorization (Caine & Caine, 2002). The brain will process dynamically when it is involved in learning. For example, to create a significant experience, the memory encounters new objects discordant with previous records or design. Therefore, the brain assesses the experiences that are conflicting to the known (Duman, 2007).

## **Importance of Brain-Based Education in Classroom**

Brain-based education has been shown to enhance students' performance as well as motivation in the classroom. Several studies (e.g., Tate, 2013; Marope, 2016; Mayer, 2017) have shown that brain centric strategies utilised in the Brain-based approach was developed based on the understanding of the various mechanisms of brain functions which has been shown to be effective in enhancing students' performance. In addition, the educational environment recommended by Brain-based education provides students with the opportunity to experience activities that are compatible with the brains' natural learning systems which has been shown to motivate students to learn, encourage achievement, as well as inspire creative thinking (Ashraf Atta, 2017).

In fact, several studies (e.g., ElAdl and Eissa Saad, 2019) strongly advocate the introduction of Brain-based learning theory in every classroom as a teaching program grounded in this theory is effective in improving students' working memory and academic motivation while improving students' overall academic achievement (Al.ljrih and Naser, 2018). This study recommends that teachers should have a basic understanding of the association between the brain and the learning environment as well as how learning can be developed and aided from a productive schoolroom. Several researchers, for instance, Jensen (2005), have a formal Brain-based training package that delivers training via trained expansion discussions, talking, and week-long training conferences for teachers. Therefore, it can be said that Brain-based learning in the classroom demonstrates a growing desire to create a positive learning condition for schoolchildren on everyday basis.

It is clear thus far that the fundamental in Brain-based learning entails an understanding of how the brain operates to maximise learning (Moghadam & Araghi, 2013). Therefore, teaching using the Brain-based approach does not only achieve to enhance short term academic performance but enhances the possibilities of retaining information and knowledge learned for an extended period of time.

## **Brain-based Approach and Language Education**

Recent studies (e.g., Khalil, El Nagar & El Mesih Awad, 2019; Parnel, 2018) have reported a growing trend of integrating Brain-based approach in language classrooms. For example, in the study by Khalil et al. (2019), 25 secondary school students in Egypt engaged in a selection

of Brain-based strategies and activities for a period of seven weeks to improve their speaking skills. The results showed that the Brain-based activities implemented was able to promote learning and enhance the development of speaking skills among the students. In addition, Brain-based learning has been shown to be an effective approach for developing listening skills, consolidate vocabulary recalling and retention as well as enhancing language learning motivation (Salem, 2017).

It is important to note that the growing number of language teaching research discoveries in neuroscience and cognitive psychology will have a positive impact on language learning. The findings of these brain centric studies will witness positive innovations being implemented in language classrooms which will be beneficial for the students involved. For example, a recent study by Monaco, Jost, Gygax, & Annoni, (2019) on sensorimotor involvement in semantic processing showed that both native and non – native speakers benefit from a sensorimotor involvement in terms of vocabulary acquisition. In addition, Hounhanou (2020) revealed that teaching English vocabulary through Physical Response allows students to learn faster and easier, since children find support from the physical representation of their facilitator or their peers. Thus, the more knowledgeable English language teachers become of the brain, its components and the various functions of these different components, the more effective teachers can become in developing their pedagogical practices.

Investigation in the Malaysian context has revealed the scarcity of the Brain-based approach in ESL teaching and learning. Even so, traces of Brain-based principles can be found in various teaching methods, programs and concepts in language teaching and learning introduced in Malaysia in recent years. A study by Saifulbahri (2014) suggests that the Brain-based strategy is still an unfamiliar approach among teachers. The findings revealed that these teachers' do not possess enough knowledge on Brain-based learning. In addition, Nirmala, La Ode and Wa Ode (2020) in their study recommended that teachers should be exposed to Brain-based method as it has been proven to improve students' vocabulary score. Hence, the current study aims to examine the use of Brain-based approach in the teaching of vocabulary in ESL classrooms.

## **Vocabulary Acquisition**

Research on vocabulary learning and acquisition did not establish the primary focus up until the early 1980s (Alharbi, 2015). In fact, vocabulary learning was known as a neglected aspect of language learning (Meara, 1980). Meara who criticized its negligence in SLA research argued that there were no clear theories on vocabulary acquisition until the late 1970s. Researchers of vocabulary learning, such as Laufer (1998), and Schmitt (1998) agreed that more exploration is needed in this area. Since then, vocabulary learning drew the attention of numerous SLA investigators in the last three decades (Alharbi, 2015). In a more recent study by Elhamdi & Hezam (2020), three main methodological challenges related to teaching English vocabulary to non-native students were identified which included student related challenges, teacher related and strategy related challenges. Among the student related challenges identified were the barriers faced by students when trying to retain new vocabularies to their long-term memories.

It is also important to note that second language learners require more diverse quantities of vocabulary than that of local speakers. On the one hand, the capacity of vocabulary learned by natural English speakers is 1,000 words per annum for university level, which later develops to 2,000 words per annum (Peregoy, Boyle, & Phillabaum, 2007). On the other hand, for second language learners, the learning period for vocabulary acquisition must be two times longer particularly for academic purposes (Alharbi, 2015). Hence, investigation and instructions on teaching words have focused on the prerequisite of exposing second language learners to fresh

words through spoken and printed resources (Peregoy et al., 2007). Accordingly, in order to efficiently grasp the meaning of new vocabulary, language students are required to be explicitly acquainted to these words (Alharbi, 2015).

In order to introduce students to a large number of brand new vocabulary items, this exposure needs to happen outside of the classroom. However, it is unlikely that young learners would know of vocabulary learning strategies, let alone apply these strategies on their own (Cameron, 2001). Therefore, training should be given to language learners about vocabulary learning strategies and how to use them. As such teachers should invest both time and effort to achieve this purpose. Furthermore, Nation (2001) asserted that vocabulary acquisition can be widened by venturing into a substantial number of vocabulary learning strategies. This is supported by Barjesteh & Alinia Omran (2019) who found that by introducing and having learners use alternative vocabulary learning strategies for practice can be considered an effective way for more effective independent vocabulary learning.

### **Vocabulary Retention**

Another significant characteristic of vocabulary acquisition is the brittleness of the retention. In fact, Elhamdi & Hezam (2020) pointed out the main challenges related to teaching English vocabulary to non-native students is the barriers faced when trying to retain new vocabularies to their long-term memories. Forgetting the learned vocabulary can mean losing all the work put into learning them. Thus, once the vocabulary items are partially or wholly learned, they should be reprocessed methodically to nurture fruitful retention (Gu, 2010; Salama, 2015; Jean Paul, 2019).

However, most language learners seem to consider that once they have considered particular words, they have accomplished learning those words. They neglect further methodical reading to recall and practice these words in other contexts. Hence, in their enthusiasm, learners may overlook some of the learnt words either partially or completely. In a study by Helaal (2020), it was concluded that the Brain-based learning helped first year preparatory school EFL students to improve their vocabulary retention. Numerous other studies (e.g., Haghighi, 2013; Salama, 2015) have reported how the implementation of Brain-based learning have promoted vocabulary acquisition retention among non-native English language learners.

In fact, Brain-based learning strategies and spaced recurrence is seen effective techniques to ensure retention of newly learned vocabulary items for a longer period of time (Zeller, 2011; Ahmad Helaal, 2020). Therefore, teaching English language through brain-based learning (BBL) does not focus on enhancing academic achievement for a short period of time, but it enhances the possibilities of keeping information and knowledge learned for a long time (Ahmad Helal, 2020). Likewise, this current study intends to examine vocabulary retention among Malaysian ESL students, specifically in the primary school level.

### **AIMS OF THE CURRENT STUDY**

Based on the discussion thus far, this study aims to answer the following Research Questions (RQ):

RQ 1: To what extent did the acquisition of target vocabulary words differ for students who were taught using the Brain-based learning strategy and students who were taught using the traditional method?

RQ 2: To what extent did the retention of target vocabulary words differ for students who were taught using the Brain-based learning strategy and students who were taught using the traditional method?

## METHODOLOGY

### Instructional Treatment

The three interactive and mutually supportive phases by Caine & Caine (1991) were integrated into all teaching and learning activities with the purpose of achieving complex learning in the classroom during each lesson. In addition, the learning and teaching process was designed based on the three rudimentary of Brain-based learning namely orchestrated immersion, relaxed alertness and active processing shown in Table 2.

**Table 2:** Three phases of learning, steps, and principles of brain-based learning

Phases of Learning and Teaching	Steps	Purpose	Principles of Brain-Based Learning Strategy (Caine & Caine, 1991)
<b>Orchestrated immersion</b>	Students are asked questions to kindle their previous knowledge. Students are shown pictures to set their mood on the topic that they are going to learn. Teacher introduces the words to be learnt for a particular session.	To give students a general idea of what is going to happen during the specific session	<i>Emotions are critical to patterning and drive our attention, meaning and memory. The search for meaning is innate</i>
<b>Relaxed alertness</b>	Students get involved in the activities which will lead them to comprehend the lessons. Students are encouraged to use the words while joining the activities such as games	To enable the words to sink into their memory	<i>Learning engages the entire physiology</i>
<b>Active processing</b>	Students need to plan for presentations such as role play, answer practices and other related activities. Students are required to use all the words that they have learnt in the lesson for the day	To get students to be involve in production	<i>We understand and remember best when facts are embedded in natural, spatial memory Learning is enhanced by challenge and inhibited by threat.</i>

During the orchestrated immersion phase, power point, flash cards and various pictures were used with the purpose of aiding pupils to master the essence of the subject – in the case of this study, it was the vocabulary items. After each set induction and presentation, pupils were guided to participate in group work related to the topic of the presentation. In addition, the pupils were listening to light and easy music during this phase.

In the relaxed alertness phase, groups consisting of mixed ability pupils were formed so that members of the group could cooperate and interact with each other and become experts in the particular topic. Subsequently knowledge obtained in the orchestrated immersion phase was adopted and internalized in the relaxed alertness phase. To strengthen the comprehension of the subject matter, the researcher prepared activities using worksheets, engaged pupils in visualization tasks, utilised i-THINK maps, organised group work and group competitions. In addition, the pupils were motivated and encouraged to converse among group members and

members of the other groups initiating a whole class interaction. Alternatively, all through the active processing phase, recreation, group discussions and role-play techniques were carried out with the purpose of ensuring and enhancing retention of the obtained vocabulary. Table 3 lists out the types of activities and the main features of the Brain-based learning principles integrated in each activity. Only the main features are identified and listed in the table.

**Table 3:** Activities and features of the Brain-based Learning Principles

<b>Treatment/ Activity</b>	<b>Features</b>	<b>Brain-based Learning Principles (Caine &amp; Caine, 1994)</b>
<b>Visual Storytelling</b>	-visual imagery -picture metaphor -music	<i>The brain understands and remembers best when facts and skills are embedded in natural spatial memory. Learning always involves conscious and unconscious processes. Appropriate environment, music and aroma excite brain activity. Each brain is unique.</i>
<b>Role Play</b>	-emotion in learning -kinaesthetic -auditory	<i>Positive climate stimulates brain function. Learning is enhanced by challenge and inhibited by threat. Learning engages whole physiology. Each brain is unique.</i>
<b>Toss &amp; Answer</b>	-kinaesthetic -verbal-linguistic -visual aid	<i>The search for meaning is innate. Learning always involves conscious and unconscious processes. Learning engages whole physiology. Brain processor works in wholes and parts simultaneously. Each brain is unique.</i>
<b>Back to Board</b>	-kinaesthetic -brainstorming -verbal -linguistic	<i>The search for meaning is innate. The search for meaning comes through brain patterning process. Learning always involves conscious and unconscious processes. Learning engages whole physiology. Complex and active experience involving movement stimulate brain development. Each brain is unique.</i>
<b>Kick Me Poison Box</b>	-making connection -develop meaning -thinking through analogies	<i>The search for meaning is innate. Learning always involves conscious and unconscious processes. Learning always takes place in two memory approaches, retaining facts, skills and procedures or making sense of experience. Brain can easily grasp and remember facts and skills embedded in its memory space. Each brain is unique.</i>
<b>i-THINK Map</b>	-brainstorming -visual imagery -demonstration of students' understanding	<i>The brain is unique and a parallel processor. Learning always takes place in two memory approaches, retaining facts, skills and procedures or making sense of experience.</i>

Principle One – Brain is a parallel processor employed in i-THINK Map activity. The brain can function simultaneously. Good teaching should coordinate all the dimensions of parallel processing, so this method is considered to be another variation that enhance learning.

Principle Two – Learning engages the entire physiology. Besides nourishment, this principle stresses on the importance of other factors that influence the optimal function of the brain such as peace, challenge, dullness, delight and satisfaction (Ornstein & Sobel 1987).

Activities such as role-play, Toss & Answer and Back to Board are interesting, fun-filled and challenging.

Principle Three – The search for meaning is innate. This is employed in activities such as Toss and Answer, Poison Box, Back to Board and Kick Me. These game-based activities are creative ways of teaching that provide meaningful challenges in learning.

Principle Six – Every brain simultaneously perceives and creates parts and wholes. This principle encourages teachers to acknowledge ‘two-brain’ doctrine (Hand 1984, Hart 1975) and the unique function of the left as well as the right brain and organize teaching and learning experience accordingly. As this study focused on vocabulary acquisition, it would be best if teachers use genuine whole-language experiences to teach.

Principle Eight – Learning always involves conscious and unconscious processes. This principle governs activities such as Toss and Answer, Poison Box, Back to Board and Kick Me. Students learn from experience while participating in the activities, at the same time allowing active processing to take place.

Principle Nine – Learning always takes place in two memory approaches: A Spatial Memory System and a Set of Systems for Rote Learning. It involves retaining facts, skills and procedures or making sense of experience. Activities such as Kick-Me and i-THINK map drawing provide opportunity for students to use their prior knowledge and actual experience to complete the task.

Principle Ten – The brain understands and remembers best when facts and skills are embedded in natural spatial memory. According to this principle, experiential learning is a tool to invoke spatial memory. In addition, complex and active experience involving movement stimulate brain development. For example, visual storytelling and role play are types of experiential learning that invokes spatial memory which eventually helps students to remember better.

Principle Eleven – Learning is enhanced by challenge and inhibited by threat. This principle promotes state of relaxed alertness in students. As positive climate stimulates brain function, teachers have to ensure that all the methodologies they use should orchestrate relaxed alertness among students. Activities such as role play is high in challenge but low in threat as students practice and work in groups to conduct their play.

Principle Twelve – Each brain is unique, and each brain is uniquely organised. Therefore, it is important to ensure students are exposed to a variety of activities through a highly involved teaching method. A variety of activities should attract students with different interests, talents, learning styles and intelligence. In this study, the researcher conducted a variety of activities in order to attract all pupils according to their individual interest.

## **Respondents of the study**

The target population for this study was taken from a sub-urban primary school located in Batu Pahat district. A sample size of 33 Year Four pupils with similar proficiency level was chosen as the participants in this study. The pupils who are around 10 years old had received about three years of formal English Language learning in primary school education and they possessed similar English language proficiency levels. The total number of samples was divided into two groups, 16 students for the control group and 17 students for the experimental group.

## **Research instruments**

Instruments used to collect the quantitative data in this study were pre-test, post-test and delayed post-tests. The pre and post-test were used to investigate students’ performance while

the delayed post-test was used to gauge students' retention level. A pre-test was administered before the treatment as the marks obtained was used for comparison with the marks collected from the post-test. This was administered to both the control group and experimental group. Next, this study continued with the three treatment sessions encompassing Brain-based learning strategy. Immediately after the three teaching and learning sessions, a post-test was conducted. However, students had to sit for another delayed post-test three weeks later to test their retention of the vocabulary items taught.

## FINDINGS AND DISCUSSION

The pre-test, post-test and delayed post-test scores for the experimental and control groups are summarized in Table 4.

**Table 4:** Pre-Test, Post-Test, Delayed Post-Test (T-test)

Groups	Pre-test	Post-test	Delayed Post-test
<b>Control Group</b> N=16	M=43.44	M=56.43	M=51.00
	SD=14.208	SD=15.36	SD=20.48
<b>t-test value</b>	t=2.939	t=5.025	t=-5.788
<b>Sig.</b>	p<0.010	p<0.000	p<.000
<b>Experimental</b> N=17	M=61.47	M=82.53	M=85.70
	SD=14.121	SD=14.47	SD=13.44
<b>t-test value</b>	t=8.313		
<b>Sig.</b>	p<0.000		

### The Pre-Test Results

Before the proposed teaching method was applied, all the pupils were taught using the traditional method. The researcher started the study by carrying out a pre-test. Through the pre-test, vocabulary acquisition scores of the pupils were equalized. Then, the students were randomly assigned to the control and experimental groups. Hence, one sample t-test was chosen to determine the significant difference among pupils who were taught using the traditional method and the Brain-based learning strategy.

As shown in Table 4, it is worth mentioning that the significance (p-value) for the 2-tailed is 0.000, which is  $p < 0.05$ . Simultaneously, the findings of the pre-test in the control group shows,  $t=2.939$ ,  $p < 0.010$ . And the findings of the experimental group showed that  $t=8.313$ ,  $p < 0.000$ . This means that the scores were equalized among pupils who were taught using the traditional method and the Brain-based learning strategy. This finding was also supported by Saleh (2012) and Salleh and Subramaniam (2019) in which the researcher found that, students from both groups (experimental and control) obtained more or less the same conceptual understanding in the pre-test administered. Another study, investigating students' achievement level, conducted by Ozden & Gultekin (2008) showed similar pre-test result which indicates there is insignificant difference between the experimental and control group students' achievement level. In the current study, the traditional teaching method encompasses rote learning activities such as spelling test, fill in the blanks, simple word games (Hangman), read

aloud, searching for meaning in the dictionary and matching activities. However, traditional teaching method could not produce a significant vocabulary acquisition among pupils.

### **The Post-Test Results**

In the post test, 33 pupils were divided into two groups: 16 in the control group and 17 in the experimental group. Pupils in the control group were taught vocabulary using the traditional method while the experimental group experienced three treatment sessions which involves teaching vocabulary using the Brain-based learning strategy. The post-test results of experimental and control groups are summarized in Table 4.

As shown in Table 4, the mean for the control group is  $M=56.4375$ , while it is  $M=82.5294$  for the experimental group. Independent T-test was performed to examine whether the two groups were significantly different or not in terms of assumption. The p value is .000 which is smaller than 0.05 ( $p<0.05$ ) which clearly indicate that the group means are significantly different. As a result, it can be said that there is a significant difference among pupils who were taught using the traditional method and the Brain- based learning strategy. Table 4 revealed that both groups scored higher in the post-test compared to the pre-test. Nevertheless, the result clearly shows that the experimental group has outperformed the control group in vocabulary acquisition. This was also supported by Khabiri & Pakzad (2012) in their study in which there was a significant difference between the control and experimental groups' mean scores on the vocabulary retention in the post-test. The current outcome corresponds with the findings or suggestion by Cameron (2001), who pointed out that young learners who are given opportunity to implement vocabulary learning strategies would benefit significantly. Teachers should take the responsibility to provide this awareness to pupils during teaching and learning activities as shown in this study. Effort invested in enhancing vocabulary teaching strategies by embedding Brain-based learning strategy is never a waste as multifaceted strategies used have been proven to be effective in vocabulary acquisition (Nation, 2001).

### **The Delayed Post Test Results**

A delayed post test was conducted three weeks later with the intention to investigate the retention of the vocabulary taught through Brain-based Learning strategy. The column on the extreme right in Table 4 outlines the findings of the delayed post-test for both the control and experimental group. Here in this study, the mean for the control group is  $M=51.0000$  and  $M=85.7059$  for the experimental group. Apart from the p value of .000 which is smaller than 0.05 ( $p<0.05$ ) which shows that the group means are still significantly different as in the post-test (See Table 2). This clearly suggests that the retention of target vocabulary words differs positively for the control group and even after a particular period gap which in this study was three weeks. In other words, this shows that pupils in the experimental group were much better at retaining the words learnt than the pupils in the control group.

Nevertheless, this finding clearly showed that loss in retention occurred more when using the traditional method compared to the Brain-based teaching method. Ozden & Gultekin (2008) asserted that the whys and wherefores of the loss in retention by the traditional method can be explained by concluding that traditional instruction fails to pay attention on the learning process. In contrast, the Brain-based learning strategy is predominantly based on process learning which puts emphasis on higher level learning, reflective thinking, longer retention, and knowledge transfer. The main target of this approach is to allow the pupils to organize and internalize recently learnt knowledge.

In addition to being relevant to the context of primary schools in Malaysia, the results obtained from the current research also confirmed earlier related findings by Goh (1997) and

Shamsun Nisa (2005) which established that Brain-based teaching approaches to be more effective than the traditional teaching method in terms of improving students' academic progress and achievement. The findings are similar to the studies conducted by Cengelci (2005) and Wortock (2002). Cengelci (2005), for example, discovered that the Brain-based learning strategy enhanced students' success in social science courses. Likewise, the outcomes of the research by Wortock (2002) proved that the embedded principles of the Brain-based learning approach in the web-based teaching procedures were extremely effective. Similarly, Getz (2003) and Cengelci (2005) produced an outcome equivalent to the current study, in their study on literature. The results of this study also showed that the Brain-based learning approach seems to be more effective compared to the traditional teaching approach in terms of vocabulary retention. Similarly, Nirmala et al. (2020) found that using techniques in Whole Brain Teaching method increase students' enthusiasm to be more active in learning process. The effective techniques used and repetition with little gap ensured retention of the newly acquired vocabulary items for a longer period of time (Tokac, 2005; Zeller, 2011). It can be concluded that students with a large collection of vocabulary may not necessarily be good at retention. Intervention of other resources, for instance, the Brain-based strategies implemented in this study, would contribute to a higher word understanding among students (Hulstijn,1992). Comparably, in his study, Ahmad Helaal (2002) reported that the implementation of the brain-based learning (program) had obviously influenced the students' vocabulary retention.

## **CONCLUSION**

At the end of this study, it is revealed that the students who were taught using the Brain-Based learning method were more successful in learning and retaining the words compared to the students who were taught using the traditional instruction methods. The findings of this study and other relevant studies (e.g., O'Mahony, 2020) have shown that the Brain-based approach will help to enhance vocabulary acquisition and retention. Teacher and English language course designers should seriously consider the inclusion of the Brain-based approach when developing English courses, particularly for primary or middle schools.

In order for the Brain-based approach to be successfully integrated in language classrooms, teachers must be equipped with the knowledge of Brain-based approach, the strategies as well as learning environments that will promote Brain-based learning. Knowledge of Brain-based learning will help to uncover various strategies to stimulate learners' brains and thus language teachers and practitioners will be able integrate these strategies in their language classrooms that will help enhance learners' vocabulary learning and retention. Simply, knowing how the brain works best allows educators to create an environment that gives the students a higher probability of success in learning (Mohamed, 2017).

The Malaysia Primary School Standard Curriculum (KSSR) stipulates that students are to be educated holistically in order to mould them to be analytical and efficient problem solvers via the development of higher order thinking skills (Malaysian Education Ministry, 2012). However, looking at the lack of studies carried out in the vocabulary development area particularly via innovative approaches such as the Brain-based learning strategy, more creative teaching strategies to teach vocabulary is needed to nurture language learners' holistic development while preparing the learners with relevant and sufficient knowledge and skills to face the challenges of the 21st century.

With the recent shift towards online learning due to the COVID-19 pandemic and the focus on the use of multimedia in teaching English, it would be interesting to examine the use of multimedia and educational technology in the teaching of English through Brain-based learning. In addition, it would also be interesting to investigate the impact of Brain-based approach on pupils' overall motivation in online English Language teaching and learning.

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