# BRAIN BASED LEARNING: AN APPROACH TO CONSOLIDATING VOCABULARY RECALL AND RETENTION

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February 9, 2024

## Abstract

This study examines the effectiveness of Brain-based learning (BBL) strategies, particularly the 3 Rs (Resonate, Reinforce, Rehearse) in consolidating vocabulary recall and retention among elementary pupils which is anchored on the 12 principles of BBL as endorsed by Caine and Caine (1994) and Caine et al. (2005). This is coupled with a conducive learning environment that promotes: relaxed alertness, orchestrated immersion, and active processing among learners. Clustered sampling was used to identify the experimental and control groups with 30 Grade 6 learners each as the participants of this study from Adlas Elementary School. A vocabulary test adapted from Schmitt was utilized for the administration of pre-test and posttest. To demonstrate the causality between the intervention and outcome, a quasi-experimental research design was adopted. The pre-test and posttest showed a significant difference with mean scores 34.53 and 44.61 respectively. The T-stat of 16.80 showed that the implementation of BBL is highly significant. Based the results, the BBL is very effective in consolidating vocabulary recall and retention among pupils. The 3Rs for vocabulary skills development improved the recall and retention of Grade 6 pupils. The structured learning of facts, concepts, and knowledge about the world, packaged with other forms of inputs that are made meaningful based on the experiences and frequency of encounters of learners, are contributing factors to word recollection and comprehension. This study proposes an effective strategy for vocabulary skills acquisition, recall, and retention of elementary students.

**Keywords**

*Brain-based learning, vocabulary skills, acquisition, recall, retention*

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## Acknowledgement

This research would not have been possible without the help of the following people whose support and guidance have helped the researchers in their venture to finish this paper.

The researchers would like to express to express their gratitude and appreciation to the following:

To the Public School District Supervisor of Silang IV, **Dr. Irma O. Ejanda** for the permission given in the conduct of the study;

To the Reading Teacher of Adlas Elementary School, **Ma'am Ester Ruth Ann Rabadan**, for agreeing to be the vocabulary teacher handling both sections in Grade Six; and

To **Adlas Elementary School**, for the accommodating the researchers to conduct their study in their school.

Glory and thanks to God in the highest!

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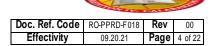| Doc. Ref. Code | RO-PPRD-F018 | **Rev** | 00 |
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## Context and Rationale

Graves (2016) declared that it is not only words that can have a powerful effect, its absence can also do. In his The Vocabulary Book: Learning and Instruction, he declared that "a number of students – including many English learners (ELs) and children growing up in poverty – enter school with debilitatingly small vocabularies that severely hamper their ability to learn to read and succeed in school (p.1)." As Yoshii and Flaitz (2019) recognized, learning and developing vocabulary is a crucial element in a student's life. To thrive, students must acquire a viable lexis that could aid in language acquisition, mastery of the lesson, and precision of oral and written communication. In a study conducted by Saavedra (2020), data revealed five factors that language teachers considered to have influenced poor English and Filipino writing skills of elementary pupils. Among them was the lack of vocabulary in the target language. In another study, Tomas, Villaros, and Galman (2021) also pointed to the limited vocabulary and inadequate word recognition of pupils as one of the causes of poor reading performance in schools. With these alarming findings, the Philippine educational landscape continually sought for ways to improve the delivery of instruction in the classroom to achieve optimum learning outcomes and improve skills such as language proficiency through vocabulary development.

This paper then, proposed the use of brain-based learning strategies.

Brain based learning is the use of research in neuroscience on how the brain works to gain understanding on how students learn and develop in a classroom (Madrazoh and Motz, 2005, p. 56). Strategies on brain based learning and their applications to reading comprehension, vocabulary development, and oral fluency, to name a few had been the subject of educational research to test their efficacy in

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achieving various learning goals. In recent years, there had been an interest in brain based learning strategies as a tool in acquiring vocabulary skills (Salem, 2017; Anderson, 2016; and Dansie, 2016). Investigations on the science of learning, particularly in the neurofunctional systems of the brain and the transmittal of neurons to neurons for storing information and making meaningful connections had been conducted in order to understand how the brain responds to verbal stimuli.

Numerous brain research had shown how the mind works when presented with new information in a variety of ways. Neurons that store data were fired simultaneously in a student's brain when appropriately stimulated and once logically connected, that data in the student's brain may be assembled logically for understanding and comprehension to take place. True learning, then, is the process of simultaneously activating multiple neurons which then send electrical impulses through the brain as they connect with one another (Dansie, 2016).

With this premise, it was the goal of this paper to determine how effective the strategies of brain-based learning were in consolidating vocabulary recall and retention. Certainly, vocabulary skills development among pupils was one of the desired goals of the Elementary English curriculum. In fact, as stated in the English curriculum guide, the utmost end of Language Arts and Multiliteracies curriculum was to produce graduates who were able to apply the conventions, principles, strategies, and skills in language when interacting with others, understanding and learning other content areas, and fending for themselves in whatever field of endeavor they may engage in. Specifically, under linguistic competence, learners were expected to master the skills of phonology, morphology, syntax, lexicology, and

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semantics. All of which involved a knowledge of words and their meanings. Henceforth, it was important for education supervisors, school administrators, and teachers to identify useful and operational strategies that could be applied so that the vocabulary skills of learners are developed and enhanced.

Anchored on the 12 principles of brain-based learning (BBL) as originally proposed by Caine and Caine (1994) and Caine et al. (2005), this study forwarded the three Rs of vocabulary skills development in order to consolidate recall and retention: resonate, reinforce, and recreate. By applying these three Rs of vocabulary skills development in a learning environment that promotes (1) relaxed alertness, (2) orchestrated immersion, and (3) active processing, the study hoped to determine the efficacy of BBL in remembering words and their usage.
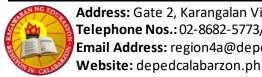
Vocabulary acquisition is a crucial part of language learning. Hence, the implementation of effective learning strategies should be done in the classroom to facilitate the enhancement of students' vocabulary skills.

## Action Research Questions

This study determined the efficacy of brain-based learning strategies namely: resonate, reinforce, and rehearse in consolidating vocabulary recall and retention among Grade 6 pupils in the District of Silang IV.

Specifically, this study aimed to answer the following questions:

1. What is the mean score of pupils before the application of brain-based learning strategies in a vocabulary test?

2. What is the mean score of pupils after the application of brain-based learning strategies in a vocabulary test?

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3.  Was there a significant difference in the mean scores of grade six pupils  before and after the application  of brain-based  learning strategies in a vocabulary  test?

## Proposed Innovation, Intervention  and  Strategy

Brain  based  learning  was  anchored  on  12  principles  formulated  by  Caine  and Caine (1994) and Caine  et al. (2005):

1.  Brain  is a parallel  processor.

2.  Learning  engages  the entire physiology.

3.  The search  for meaning  is innate.

4.  The search  for meaning  occurs  through  patterning.

5.  Emotions  are critical  to patterning.

6.  Every brain simultaneously  perceives  and creates  parts and wholes.

7.  Learning  involves  both focused attention  and peripheral  attention.

8.  Learning  always  involves  conscious  and unconscious  processes.

9.  We have at least two types of memory systems: spatial  and rote learning.

10. The  brain  understands  and  remembers  best  when  facts  and  skills  are embedded  in the natural spatial  memory.

11. Learning  is enhanced  by challenge  and inhibited  by threat.

12. Every brain  is unique.

These  principles  supported  three  didactical  elements  that  guided  academicians in  creating  conducive  learning  environments  for  students.  First  was  relaxed alertness.  BBL  purported  that  learning  was  optimized  with  the  creation  or establishment  of a calm environment  with a low feeling  of threat or fear and a high

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sense of challenge. Second, orchestrated immersion. This refered to an enhanced learning environment that exposed students to various teaching techniques, strategies, approaches and learning tasks where their participation and involvement was maximized. And third was active processing. This was the state of internalization, sense creation, and consolidation and firming of experience through reflection and application.

In this study, the three Rs of vocabulary skills development: resonate, reinforce, and recreate endorsed these principles.

Resonate

First, the brain distinguished data obtained from the senses in separate but interrelated regions. Sensory response centered then connected to higher cortical function for the manipulation of words. Active processing or doing things with words took place so that learners take ownership of the new word. According to Willis (2008), in neurological terms, that ownership meant the creation of new links in the neuron network that connected the new words to similar words in a patterning and categorization process. Through varied engagements with the new words, students made sense of the new vocabulary.

The goal of this stage of learning was to motivate students to attend closely to the sensory input of the pertinent word or information while keeping their stress down and allowing the input of the rest of the data to reach the rest of the brain.

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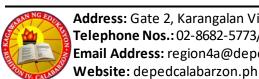| Doc. Ref. Code | RO-PPRD-F018 | Rev | 00 |
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Here, teachers used various strategies to help students build both their confidence and competence. Students should be able to see that vocabulary building practices are intrinsically valuable, desired, and achievable. Teachers moved to get students invested in the task so they become more motivated to the do the work and stay on it to achieve the desired vocabulary.

Reinforce

Vocabulary learning like any desired knowledge building behavior must be reinforced in a rewarding manner to maintain interest and motivation. Reinforcement was an example of the external motivation that can help students to learn English (Fitriati, Fatmala, and Anjaniputra, 2020). Through this process, a possibility of increasing or repeating a behavior was created as a form of response to a behavior that had been rewarded or recognized. Reinforcement strategies may include ongoing assessment and corrective feedback, praise, symbolic rewards, tangible rewards, tokens, and others.

Rehearse

Repetitive use of the new vocabulary needed to be sustained for the knowledge to go from short – term to long-term memory storage where it can be accessed readily in the future. These rehearsals or practices needed to be sustained over time so that consistent patterns of neuronal activation occur repetitively, strengthening the networks that link vocabulary in brain storage centered to the processing centers of higher cognition.

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Vocabulary knowledge in young children directly affected their later success in learning to read (Roit, 2002). Children who entered school with limited vocabulary knowledge fell even further behind over time in reading fluency and comprehension (Baker, Simmons, and Kame'enui, 1997). Thus, this study proposed an intervention strategy to enhance the vocabulary proficiency of elementary pupils. Guided by the 12 principles of Brain-based learning, the teacher integrated the 3 Rs of vocabulary skills development in the English Elementary curriculum.

## Action Research Methods

### A. Participants and/or other Sources of Data and Information

Participants from this study were pupils from Adlas Elementary School. Two Grade Six sections were identified which will form the experimental and control groups. Each section was composed of 30 learners. Only one teacher handled the experimental and control groups. 34 learners were randomly chosen to become the participants of the study. The impact of the brain-based learning strategy, 3 Rs intervention, to vocabulary recall and retention of these Grade six pupils was measured through the significant difference between the pretest and post test results.

This study used quantitative research design in identifying the effectiveness of brain-based learning in students' vocabulary recall and retention. Specifically, to demonstrate the causality between the intervention and outcome, a quasi-experimental research design was adopted.

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## B. Data Gathering Methods

The study utilized action research design observing quasi-experimental method which will basically aim to explore a phenomenon and at the same time investigate impact of the program in the consolidation of vocabulary recall and retention among Grade six pupils in Adlas Elementary School through the use of brain-based strategies: resonate, reinforce, and rehearse. Data were gathered through the administration of pre and post-tests in vocabulary.

During the study, participants were tested twice: once before the experiment (vocabulary pretest) and another (posttest) after the treatment using Brain based instructional strategies. The tests consisted of 20 multiple choice items.

School Learning Action Cells was conducted at the district level to capacitate tool subject teachers with regard to the application of Brain-based learning strategies and principles in the classroom.

Monitoring and evaluation was also done to determine the status quo of the program.

## C. Data Analysis Plan

The design of this study was based on a quasi-experimental method (i.e., the pretest, the treatment, and the posttest). This study consisted of one experimental group and one control group while focusing on the variable of vocabulary intervention strategy through brain-based learning as the independent variable and vocabulary recall and retention as the dependent variable. To test if there is a significant difference between the means of the pretest and post test, T-test was used in order to identify the effectiveness of the intervention used.

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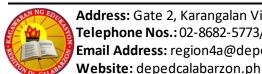| Doc. Ref. Code | RO-PPRD-F018 | Rev | 00 |
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### Discussion of Results and Reflection

Based on the data gathered from the administration of pre-test, intervention, and post test, here are the results of the study:

**Table 1: T-test Result of Pretest and Post Test**

| Test | N | Mean | T-stat | p-value | Remarks |
|------|---|------|--------|---------|---------|
| Pretest | 34 | 34.53 | | | |
| | | | 16.80 | 0.0000 | Highly Significant |
| Post-Test | 34 | 44.61 | | | |

The table above shows that before the implementation of brain-based learning, the mean of Pretest is 34.53 which is 10.08 lesser than the Post Test with a mean of 44.61. Since the mean score of the post-test is higher than the pre-test, it typically indicates that there has been an improvement or increase in the measured variable between the two testing points. In this context, this could suggest that the intervention or learning experience has had a positive impact, leading to an increase in knowledge, skills, or understanding among the participants.

Further, the result of the conducted T-Test has a T-stat of 16.80 making it highly significant. Since the result of the conducted t-test is highly significant, it means that the difference between the two groups being compared is unlikely to have occurred by random chance. In other words, there is strong evidence to suggest that there is a real difference between the groups. This can be important in this

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research because it suggests that the factor being studied, specifically the brain-based learning, may have a significant effect on the outcome being measured. This proves that the implemented intervention is considered to be very effective in developing students' vocabulary recall and retention.

The results of the study evidently showed how brain-based learning address the need for students' vocabulary recall and retention. It has proved that by engaging students in activities that stimulate the brain, such as active vocabulary learning, students can enhance their ability to recall and retain new words. Also, incorporating multi-sensory learning techniques, such as using visual aids, listening to spoken words, and engaging in hands-on activities, can enhance vocabulary learning and retention. Furthermore, connecting new vocabulary words to existing knowledge and experiences can help make students more memorable and easier to recall. Through this, one of the possible significance is the incorporation of brain-based learning to the teaching strategies of teachers in elementary level.

**Action Plan**

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Implementing brain-based learning strategies can be highly effective for improving vocabulary recall and retention. Below is the proposed action plan to incorporate these strategies:

| OBJECTIVES/ TARGETS | STRATEGIES/ ACTIVITIES | TIME FRAME | PERSON INVOLVED | EXPECTED OUTPUT | REMARKS |
|---|---|---|---|---|---|
| • To improve the delivery of instruction in the classroom to achieve optimum learning outcomes and improve skills such as language proficiency through vocabulary development<br>• To develop students' mastery skills of phonology, morphology, syntax, lexicology, and semantics<br>• To develop activities and learning materials that can help improve student vocabulary recall and retention | • The proponents of the study will conduct training for teachers on the use of brain-based learning in the classroom<br>• Integration of brain-based learning as part of the teachers' literacy classroom environment<br>• Contextualize learning and instructional materials and activities that will promote vocabulary recall and retention | Year-round | • Research Proponents<br>• Reading Teachers<br>• Subject Teachers<br>• Master Teachers<br>• School Principals<br>• District Supervisors<br>• EPS in English | • School-based program plan of the implementation of brain-based learning<br>• Lesson plans with integrated brain-based learning as part of the teaching process.<br>• Contextualized learning and instructional materials and activities that will promote vocabulary recall and retention<br>• A higher rate of literacy among elementary students | The teacher will achieve the following educational objectives:<br>• DO 12, S. 2015 - Guidelines On The Early Language, Literacy, And Numeracy Program: Professional Development Component<br>• PPST Domain 1, Strand 1.4.4 - Model a comprehensive selection of effective teaching strategies that promote learner achievement in literacy and numeracy.<br>• DO 18, S. 2017 - Guidelines On The Utilization Of The 2017 Every Child A Reader Program Funds For The Early Language, Literacy, And Numeracy Program: Professional Development Component |

*Figure 1: Sample Proposed Action Plan*

This action plan will help teachers be familiarized with the principles of brain-based learning, such as the importance of engaging multiple senses, providing meaningful and relevant learning experiences, and creating a positive emotional climate for learning. Further, design a classroom that will promote engaging learning activities for vocabulary learning.

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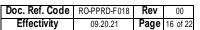**Address:** Gate 2, Karangalan Village, Cainta, Rizal
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