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TEACHING APPROACH THROUGH BRAIN-BASED LEARNING DESIGN ON THE STUDENTS' SELF- EFFICACY AND ACADEMIC OUTCOMES IN SCIENCE CLASSROOM

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ABSTRACT

The study focused on the Effect of utilizing Brain-based learning design to the self-efficacy and outcomes of the students in science classroom. The researcher surveyed 167 Grade 8 students whom the data needed to identify that the level of brain-based learning design, level of students' self-efficacy, level of students' written output, level of students' performance output and influences brain-based teaching approach students' self-efficacy and contribute to their academic outcomes in the science classroom.

The study utilized concurrent mixed method research design. The main instrument that will be use is a researcher-made questionnaire checklist in the form of multiple-choice test to gather the needed data and semi structured interview questionnaire. The respondents of the study are one hundred sixty-seven (167) Grade 8 students of Pedro Guevara Memorial National High School for quantitative data while 6 participants were included to obtain. The statistical tools used were mean, standard deviation and quantile regression was used to test the hypothesis. From the procedure recapitulated from above, the basic questions were solved.

Based on the results of the data, the findings were drawn from this study. The implementation of brain-based teaching approach in science were very high in terms of spaced repetition, generative learning, reproducing information, and chunking. Students attained very high perception on their capacity upon integration of brain-based learning design in the teaching and learning process. Most of the students were classified as Fairly Satisfactory, some Did not meet expectation and only few of them are showed satisfactory in written output in terms of diagnostic assessment while most of the respondents are very satisfactory, some are satisfactory and others attained outstanding performance in written output in terms of summative. Also, Most of the students showed outstanding level of students' performance output terms of Practical Test while there are only few who are classified as very satisfactory. Furthermore, the brain-based learning design were viewed by the learners as effective learning design for science subject as it enhance their competency, efficacy and learning experiences.

In line with the findings of the study it can be concluded that there is significant effect in utilizing brain-based learning design to the students' self-efficacy. Thus, the posited null hypothesis is rejected. Denoted that the brain based learning design aids the development of student's self-efficacy. While, finding show that utilizing design approach has no significant effect in to the students' outcomes thus the posited null hypothesis stating that There is no significant effect in utilizing teaching approach to the students' outcomes is sustained.

Based on the conclusions laid, it is recommended that schools are suggested to promote brain-based learning for complex topics, share best practices among teachers, involve students in goal-setting, use interactive methods to boost participation and confidence, identify learning styles, and use interactive activities to enhance learning experiences. Future research should explore how students adapt brain-based methods in their study habits and how it affects their academic performance.

KEYWORDS: *Brain-based learning; self-efficacy and outcomes*

1. INTRODUCTION

Brain-based teaching and learning design is a global trend in education that shows a relative importance about aligning teaching practices with the principle of Neuroscience.

Over the last two decades, the area of brain-based learning has expanded dramatically. It is realistic to predict that its research and applications in teaching and learning will continue to grow in the United States and many other nations. The most recent MI brain research has three advantages. First, it gives educators access to brain research so they may make academic brain-based linkages to teaching and learning. Second, it enables educators to create classroom and school environments that can accommodate an increasingly varied collection of student learners. Finally, it is becoming obvious that BBL research and techniques lay a solid platform for educators all across the world to build effective Learning and Brain Communities.

Several Asian countries, including Japan, South Korea, and Singapore, have used innovative teaching practices in their curricula to overcome learning gaps created by diverse phenomena. They discovered that Brain-Based Learning is an excellent strategy to achieve these goals because it encourages educators' flexibility in designing teaching techniques to accommodate varied learning styles and uses technology to provide personalized learning experiences. Furthermore, in the Asian setting, Brain-Based Learning ideas have been integrated into STEM (Science, Technology, Engineering, and Mathematics) education to enhance the development of critical thinking and problem-solving skills.

In the Philippines, education is evolving, with students taking charge of their own learning. Technology, especially during the COVID-19 pandemic, has made things faster. Due to the lack of in-person meetings, blended learning has been adopted as a combination of online and in-person instruction, allowing for a more efficient way to keep education ongoing.
Public schools are undergoing a new teaching model, with teachers and educators working together to ensure adequate materials for all students. They aim to make learning enjoyable,

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accessible, and focused on improving weaker skills. They also strive to create a relaxing and stress-free learning environment, aiming to make the learning process more enjoyable and accessible for all students.

1.1 Statement of the Problem

This study tried to answer the following questions:

1.What is the level of Brain-based Learning Design in terms of:

1.1. Spaced Repetition
1.2. Generative Learning
1.3. Reproducing Information
1.4. Chunking

2. What is the level of students' self-efficacy in terms of:

2.1. Performance Accomplishments
2.2. Goal Setting
2.3. Problem-solving Abilities
2.4. Self-reflection

3. What is the level of students' written output in terms of:

3.1. Diagnostic Assessment
3.2. Summative Assessment

4. What is the level of students' performance output terms of:

4.1. Practical Test

5. Singly with combination do the brain-based learning design significantly affect students' self-efficacy?

6. Singly with combination do the brain learning design significantly affect students' outcome?

7. How does Brain-Based learning design influences students' self-efficacy and contribute to their academic outcomes in the Science Classroom?

2. METHODOLOGY

The study utilized the concurrent mixed method design. The researcher collect data to answer research question both quantitative and qualitative data at the same time and triangulate the result for crafting the conclusion of the research.

Mixed-ways research is a method that uses interpretivism and post-positivism frameworks to analyze data from multiple sources in a single study. This approach provides a logical foundation, methodological flexibility, and a comprehensive understanding of small cases. It allows researchers to answer inquiries in-depth and generalize results to the entire community, combining quantitative data collection with qualitative data for deeper insights, Dawadi et al. (2021).

3. RESULTS AND DISCUSSION

This chapter enumerates the different results and discusses the results that were yielded from the treatment of the data that was gathered in this study. The following tabular presentations and discussions will further characterize the brain based learning design and student's self efficacy and outcome..

In this study, the level of brain based-brain based learning refers to spaced repetition, generative learning, reducing information, and chunking.

The level of brain based learning design were revealed in the following table, which shows the statement, mean, standard deviation and verbal interpretation.

Table 1 illustrates the level of Brain-based Learning Design in terms of Spaced Repetition. The students attain very high *(M=4.31, SD=0.36)* utilization of brain-based learning in terms of spaced repetition. This denoted that the learners effectively used brain-based learning in enhancing memorization and recall of the topics discussed to maintain long term retention of knowledge.

Table 1. Level of Brain-based Learning Design in terms of Spaced Repetition

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Brain-Based Learning Design helps me remember and retain information more effectively.	4.43	0.56	Strongly Agree
2. Brain-Based Learning Design is a useful strategy for my long-term learning	4.30	0.54	Strongly Agree
3. Brain-Based Learning Design encourages me to review and revisit my learning materials regularly.	4.19	0.66	Agree
4. Brain-Based Learning Design makes me feel more confident in my knowledge when I use spaced repetition techniques.	4.27	0.66	Agree
5. Brain-Based Learning Design is an effective way to enhance my memory and recall abilities.	4.38	0.57	Strongly Agree
Weighted Mean		*4.31*	
SD		*0.36*	
Verbal Interpretation		*Very High*	

It is evident that the students are strongly agree *(M=4.43, SD=0.56)* that Brain-Based Learning Design helps them to remember and retain information more effectively. This signified that through the process of teaching focus on latest scientific methods on brain functions aided learners to remember the concept perceived through discussion as it is based on student's cognitive nature.

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Conforming to Hermann Ebbinghaus (2018), you can memorize information far more quickly with spaced repetition than you would with any other method. Spaced repetition is a technique that avoids trying to jam too much information into your memory at once by spacing out your repetitions, or review sessions. Attempting to learn everything in a single sitting is impractical. Our brains should be treated like muscles even though they are not in a physical sense.

On the other hand, the students are agree (*M=4.19, SD=0.66) that brain based learning encourages the students to review and revisit the learning materials regularly*. With the strategy of teaching on brain process allowed students to assess the alignment of learning materials to their process of cognitive development for them to attain mastery of the concept.

Table 2 illustrates the level of Brain-based Learning Design in terms of generative learning. The students attain very high *(M=4.26, SD=0.33)* experiences in integration of brain-based learning in terms of generative learning. This denoted that the learners develop an ability to actively engage in teaching material and strategy that allows them to relate personal experiences to present concept leading to conceptualizing own understanding of the topic.

Table 2. Level of Brain-based Learning Design in terms of Generative Learning

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Brain-Based Learning Design such as summarizing and teaching others, help me understand the lessons better.	4.44	0.62	Strongly Agree
2. Brain-Based Learning Design encourages me to actively engage with the content, making it more memorable.	4.16	0.55	Agree
3. Brain-Based Learning Design makes me feel more confident in my understanding of the subject when I use generative learning methods.	4.29	0.63	Strongly Agree
4. Brain-Based Learning Design helps me relate new information to what I already know.	4.33	0.69	Strongly Agree
5. Brain-Based Learning Design I believe that generative learning is a valuable approach for deepening my understanding of complex topics.	4.07	0.62	Agree
Weighted Mean		*4.26*	
SD		*0.33*	
Verbal Interpretation		*Very High*	

It is evident the learners are strongly agree *(M=4.44, SD=0.62)* that brain-based learning design such as summarizing and teaching others, help me understand the lessons better. This entailed that brained based learning integration in teaching methods with emphasis summarizing and sharing of perception regarding personal understanding aid student processing of information for better retention and application of concepts.

Moreso, students are agree *(M=4.07, SD=0.62)* that brain-based learning design developed generative learning that is a valuable approach for deepening my understanding of complex topics. This proved that students develop a better understanding of the concept and perceived in-depth knowledge about the topic as there is the lesson designs that focus on creating general concept of bits of information from the discussion.

Table 3. Level of Brain-based Learning Design in terms of Reproducing Information

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Brain-Based Learning Design such as summarizing or rewriting, helps me understand the material better.	4.59	0.56	Strongly Agree
2. Brain-Based Learning Design encourages me to actively engage with the content, making it more memorable.	4.16	0.55	Agree
3. Brain-Based Learning Design assist me in organizing and structuring my thoughts.	4.07	0.62	Agree
4. Brain-Based Learning Design is a valuable approach for improving my overall learning experience.	4.36	0.67	Strongly Agree
5. Brain-Based Learning Design I feel more confident in my understanding of the subject when I use reproducing information methods	4.30	0.66	Strongly Agree
Weighted Mean		*4.30*	
SD		*0.34*	
Verbal Interpretation		*Very High*	

Table 3 illustrates the level of brain-based learning design in terms of reproducing information. The students attain very high *(M=4.30, SD=0.34)* experiences in integration of brain-based learning in terms of reproducing information. This entailed that that the learners develop an ability to recall information from the discussion through brain-based learning and creates

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connections of concepts to create similar idea that some up their understanding.

The table shoed that the learners are strongly agree *(M=4.59, SD=0.56)* that brain-based learning design such as summarizing or rewriting, helps me understand the material better. It proved that teaching approaches that required learners to create concept maps o idea which summarize their perceived information through writing leads to the better learning experiences and longer retention of the topic.

Moreso, it can be gleaned from the table that the learners are agree *(M=4.16, SD=0.55)* brain-based learning design encourages them to actively engage with the content, making it more memorable. This implied that the consideration of brain-based learning model in educating learners encourage student's involvement in the teaching-learning process which gave emphasis on the important concept of discussion to produce long-term retention and understanding.

Table 4 illustrates the level of brain-based learning design in terms of chunking. The students attain very high *(M=4.30, SD=0.34)* experiences in integration of brain-based learning in terms of chunking. This entailed that that the learners developed an ability to recall information from the discussion through dividing complex information into smaller group of ideas which are easy to understand based on the student's level of understanding and information processing leading to better learning experiences and understanding.

In accord with Internet Achieve Scholar (2018), chunking is the process of organizing disparate pieces of information into more digestible or significant sections. By doing that, you help others and yourself understand and remember the information. The "information" on the tray is much easier to comprehend and remember when the items are categorized. It's also unnecessary to examine each item closely because you can quickly scan the tray to see what's being offered.

Table 4. Level of Brain-based Learning Design in terms of Chunking

STATEMENTS	***MEAN***	***SD***	***REMARKS***
1. Brain-Based Learning Design helps me break down complex topics into more manageable parts.	4.04	0.59	Agree
2. Brain-Based Learning Design assist me in organizing and structuring my study materials.	4.28	0.62	Strongly Agree
3. Brain-Based Learning Design helps me to analyze the lesson parts-by-parts	4.48	0.62	Strongly Agree
4. Brain-Based Learning Design aids me in learning the specific context in the lesson that I have to focus on	4.26	0.63	Strongly Agree
5. Brain-Based Learning Design let me see the small components of the lesson and focus on them one-by-one	4.28	0.67	Strongly Agree
Weighted Mean		*4.27*	
SD		*0.36*	
Verbal Interpretation		*Very High*	

It is evident from the table that the learners are strongly agree *(M=4.48, SD=0.62)* that brain-based learning design helps me to analyze the lesson parts-by-parts. This entailed that the used of brain based learning approach in teaching learning process developed the ability of the students to divide the concepts of the lesson and create maps to better understand the complex idea of the specific lesson.

Conforming to American Psychological Association (2018), they define chunking as the method by which the brain breaks down important information into smaller, easier-to-remember chunks for short-term memory. Chunking is a technique used in psychology and education to connect disparate ideas so that the information is simpler to comprehend and retain. In psychology, a chunk is defined as a group of similar units or pieces of information combined into one. Learning to chunk your memory may help you improve your cognitive ability, short-term memory, and school or work function.

In addition, the learners are agree *(M=4.04, SD=0.59)* that brain-based learning design helps me break down complex topics into more manageable parts. This indicated that learners develop better understanding of the lesson as they break down complex idea into bite size portion of information which allows them to memorize and comprehend idea for better recall.

In this study, the level of students' self-efficacy refers to performance accomplishment, goal setting, problem solving abilities, and self-reflection

The level of level of students' self-efficacy were revealed in the following table, which shows the statement, mean, standard deviation and verbal interpretation.

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Table 6. Level of Students' Self-Efficacy in Terms of Performance Accomplishments

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Teaching Approach Through Brain-Based Learning Design give me a sense of accomplishment in my academic achievements.	4.44	0.59	Strongly Agree
2. Teaching Approach Through Brain-Based Learning Design makes me feel confident in my ability to successfully complete assignments and projects.	4.53	0.56	Strongly Agree
3. Teaching Approach Through Brain-Based Learning Design make me believe that my test scores will accurately reflect my understanding of the material.	4.27	0.63	Strongly Agree
4. Teaching Approach Through Brain-Based Learning Design makes me motivated to excel academically and achieve high grades.	4.43	0.60	Strongly Agree
5. Teaching Approach Through Brain-Based Learning Design let actively seek feedback from teachers to improve my performance.	4.13	0.59	Agree
Weighted Mean		*4.36*	
SD		*0.34*	
Verbal Interpretation		*Very High*	

Table 6 illustrates the level of students' self-efficacy in terms of performance accomplishment. The students attain very high *(M=4.36, SD=0.34)* perception on their capacity to accomplish different performances upon integration of brain-based learning design in the teaching and learning process. This implied that students had high perception on their own capacity to accomplish different academic task particularly regarding performance evaluation that execute their mastery of competency as they are exposed in teaching process with the use of brain-based learning design.

It is evident from the result that learners are strongly agree *(M=4.53, SD=0.59*) that Brain-Based Learning Design give a sense of accomplishment in my academic achievements. This prompted that learners develop the sense of accomplishment upon involvement in brain-based design integration in teaching and learning process as they increase their academic achievement.

Also, learners are agree *(M=4.13, SD=0.59)* that Teaching Approach Through Brain-Based Learning Design let actively seek feedback from teachers to improve my performance. It can be gleaned that learners are eager to asked teachers suggestion and comments regarding their academic performance upon the integration of brain-based teaching approach in the discission of the lesson.

Table 7 illustrates the level of students' self-efficacy in terms of goal setting. The students attain very high *(M=4.39, SD=0.41)* perception on their capacity to set learning goal. This implied that students had high perception on their own capacity to create a specific and achievable learning goals upon exposure in the brain-based teaching approach of the subject.

Table 7. Level of Students' Self-Efficacy in terms of Goal Setting

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Teaching Approach Through Brain-Based Learning Design makes me believe that setting clear academic goals is important for my success.	4.53	0.61	Strongly Agree
2. Teaching Approach Through Brain-Based Learning Design helps me regularly set specific and achievable goals for my academic performance.	4.34	0.63	Strongly Agree
3. Teaching Approach Through Brain-Based Learning Design aids me to review and adjust my academic goals periodically to ensure they are relevant.	4.17	0.56	Agree
4. Teaching Approach Through Brain-Based Learning Design makes me motivated to excel academically and achieve high grades.	4.50	0.61	Strongly Agree
5. Teaching Approach Through Brain-Based Learning Design makes me feel motivated to work towards my academic goals.	4.42	0.67	Strongly Agree
Weighted Mean		*4.39*	
SD		*0.41*	

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Verbal Interpretation	*Very High*

It is evident on the result that learners are strongly agree *(M=4.53, SD=0.61)* that Teaching Approach Through Brain-Based Learning Design makes me believe that setting clear academic goals is important for my success. This indicated that learners perceived the importance of setting clear academic objectives to successful academic performance as they are experienced teaching-learning process through the integration of brain-based model.

More so, the learners are agree *(M=4.17, SD=0.56)* that teaching approach through brain-based learning design helps me regularly set specific and achievable goals for my academic performance. This indicated that learners develop clear and achievable learning objectives and academic goal upon exposure on the teaching approach aligned to brain-based learning.

Table 8 illustrates the level of students' self-efficacy in terms of problem-solving abilities. The students attain very high *(M=4.25, SD=0.36)* perception on their capacity to solve problems. This implied that students had high perception on their own capacity think critically and process complex information that leads to solution as they exposed in brain-based learning approach.

Table 8. Level Of Students' Self-Efficacy in Terms of Problem-Solving Abilities

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Teaching Approach Through Brain-Based Learning Design makes me feel confident in my ability to identify and define problems in academic tasks.	4.41	0.56	Strongly Agree
2. Teaching Approach Through Brain-Based Learning Design helps me to become skilled at breaking down complex problems into smaller, more manageable parts.	4.18	0.63	Agree
3. Teaching Approach Through Brain-Based Learning Design aids me to seek help in identifying and solving problems.	4.18	0.63	Agree
4. Teaching Approach Through Brain-Based Learning Design makes me persistent in finding solutions to challenging problems	4.18	0.63	Agree
5. Teaching Approach Through Brain-Based Learning Design makes me use creative thinking and innovation when faced with a problem.	4.28	0.65	Strongly Agree
Weighted Mean		*4.25*	
SD		*0.36*	
Verbal Interpretation		*Very High*	

The results showed that learners are strongly agree *(M=4.25, SD=0.36)* that Teaching Approach Through Brain-Based Learning Design makes me feel confident in my ability to identify and define problems in academic tasks. This implied that learners perceived high ability to identify challenges and problems in academic requirement and tasked assign and produced solutions out of it.

Also, the learners are agree *(M=4.18, SD=0.63)* teaching Approach through brain-based learning design helps me to become skilled at breaking down complex problems into smaller, more manageable parts, aids to seek help in identifying and solving problems, and use creative thinking and innovation when faced with a problem. This implied that learners better perceived their capacity to break down complex information through critical thinking and analysis which leads to problem identification and address through innovative approach as they are exposed in brain-based teaching approach.

Table 9. Level of Students' Self-Efficacy in Terms of Self-Reflection

STATEMENTS	*MEAN*	*SD*	*REMARKS*
1. Teaching Approach Through Brain-Based Learning Design helps me to regularly reflect on my academic strengths and weaknesses.	4.39	0.55	Strongly Agree
2. Teaching Approach Through Brain-Based Learning Design let me take the time to think about what I have learned after completing assignments or projects.	4.38	0.60	Strongly Agree
3. Teaching Approach Through Brain-Based Learning Design makes me consider how my study habits impact my academic performance.	4.33	0.61	Agree
4. Teaching Approach Through Brain-Based Learning Design makes me reflect on the feedback I receive from teachers to improve my work	4.26	0.70	Strongly Agree

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5. Teaching Approach Through Brain-Based Learning Design aids me to set specific time to reflect on my academic performance.	4.22	0.72	Strongly Agree
Weighted Mean		*4.32*	
SD		*0.40*	
Verbal Interpretation		*Very High*	

Table 9 illustrates the level of students' self-efficacy in terms of self-reflection. The students attain very high *(M=4.25, SD=0.36)* perception on their capacity reflect on their own understanding. This implied that students had high perception on their own capacity to think on their study habits and the results of practice in the development of their learning and understanding.

The results showed that learners are strongly agree *(M=4.39, SD=0.55)* that teaching approach through brain-based learning design helps me to regularly reflect on my academic strengths and weaknesses. This inferred that the learners practice self-reflection on their strength and weaknesses as they exposed on brain-brain based teaching approach.

Also, learners are agree *(M=4.33, SD=0.61*) that teaching approach through brain-based learning design makes me consider how my study habits impact my academic performance. The students had the chance to perceived the importance of their study habits in their academic performance as they are exposed in brain based teaching approach. The students had the time to identify which learning practice contributed more to their development as a students and which practices may lead to decline in academic achievement.

In this study, the level students' written output refers to diagnostic assessment and summative assessment. The level of student's written output were revealed in the following table, which shows the statement, mean, standard deviation and verbal interpretation.

Table 11. Level of Students' Written Output in Terms of Diagnostic Assessment

Score	f	%	Descriptive Equivalent
41 - 50	0	*0.00*	Outstanding
31 - 40	0	*0.00*	Very Satisfactory
21 - 30	21	*12.57*	Satisfactory
11 - 20	135	*80.84*	Fairly Satisfactory
0 - 10	11	*6.59*	Did not meet Expectation
Total	**167**	**100**	
Weighted Mean	15.83		
SD	4.01		
Verbal Interpretation	*Fairly Satisfactory*		

Table 11 presents the level of students' written output in terms of Diagnostic Assessment. Out of total number of one hundred and sixty-seven respondents *"11 to 20*" received the highest frequency of one hundred and thirty-five (135) or 80.84% of the total population with descriptive equivalent of *Fairly Satisfactory*. While the scores *"0 to 10*" received the lowest frequency of eleven (11) or 6.59% of the total population with descriptive equivalent of *Did not meet Expectation*.

With a *(Weighted Mean = 15.83, SD = 4.01)* it shows that the level of students' written output in terms of Diagnostic Assessment has a descriptive equivalent of *Fairly Satisfactory*. This implied that most of the learners scored from 0 to 30 out of 50 item diagnostic test which is par from passing score. Students are considered below average in written works before the implementation of brain-based teaching approach.

Table 12. Level of Students' Written Output in Terms of Summative Assessment

Score	f	%	Descriptive Equivalent
41 - 50	51	*30.54*	Outstanding
31 - 40	104	*62.28*	Very Satisfactory
21 - 30	12	*7.19*	Satisfactory
11 - 20	0	*0.00*	Fairly Satisfactory
0 - 10	0	*0.00*	Did not meet Expectation
Total	**167**	**100**	
Weighted Mean	37.84		
SD	5.01		
Verbal Interpretation	*Very Satisfactory*		

Table 12 presents the level of students' written output in terms of summative assessment. Out of total number of one hundred and sixty-seven respondents *"31 to 40*" received the highest frequency of one hundred and four (104) or 62.28% of the total population with descriptive equivalent of *Very Satisfactory*. While the scores *"21 to 30*" received the lowest frequency of

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twelve (12) or 7.19% of the total population with descriptive equivalent of *Satisfactory*.

With a *(Weighted Mean = 37.84, SD = 5.01)* it shows that the level of students' written output in terms of Summative Assessment has a descriptive equivalent of *Very Satisfactory*. This can be gleaned that most of the learners improved their performance in written activities and learning after being exposed in brain-based teaching approach which they are classified as above average.

In this study, the level of students' performance output refers to practical test. It was revealed in the following table, which shows the statement, mean, standard deviation and verbal interpretation.

Table 13. Level of Students' Performance Output Terms of Practical Test

Score	f	%	Descriptive Equivalent
17 - 20	146	*87.43*	Outstanding
13 - 16	21	*12.57*	Very Satisfactory
9 - 12	0	*0.00*	Satisfactory
5 - 8	0	*0.00*	Fairly Satisfactory
0 - 4	0	*0.00*	Did not meet Expectation
Total	**167**	**100**	
Weighted Mean	17.87		
SD	1.32		
Verbal Interpretation	*Outstanding*		

Table 13 presents the level of students' performance output terms of practical test. Out of total number of one hundred and sixty-seven respondents *"17 to 20*" received the highest frequency of one hundred and forty-six (146) or 87.43% of the total population with descriptive equivalent of *Outstanding*. While the scores *"9 to 12*" received the lowest frequency of twenty-one (21) or 12.57% of the total population with descriptive equivalent of *Very Satisfactory*.

With a *(Weighted Mean = 17.87, SD = 1.32)* it shows that the level of students' performance output terms of Practical Test has a descriptive equivalent of *Outstanding*. The data showed that learners are performing above the average category in terms of practical test upon expose in brain based teaching approach as the learner attain mastery of the concept and synthesize the importance and application of the concept in the given task.

In this study, the hypothetical question would like to determine the relationship of independent variable particularly the brain-based learning design to dependent variable which happened to be the student's self-efficacy.

The relationship of brain-based learning design and student's self-efficacy were revealed in the following table, which shows the p-value, strength of relationship and verbal interpretation.

The table presents the results of a multiple regression analysis examining the effect in utilizing brain based learning design to the students' self-efficacy. The *Spaced Repetition*, *Generative Learning*, and *Chunking* have a significant effect to Performance Accomplishments. The F-test of the overall model is significant ($F(4, 162) = 30.04$ with, $p < 0.001$), indicating that the regression model is a good fit for the data. This implied that the utilization of brain-based teaching approach focus on repetition techniques, summarizing facts from discussion and breaking down of complex information into easy to understand bits of information aid learners to develop competency and attain mastery level which they apply in their performance task leading to accomplishments and academic achievement.

Table 14. Regression Analysis on the Effect in Brain-Based Learning Design to the Students' Self-Efficacy

Performance Accomplishments	**B**	**SE**	**β**	**t**	**p**
Constant	1.177	.304		3.874*	<.001
Spaced Repetition		.071	.152	2.145*	.033
Generative Learning		.085	.282	3.305*	.001
Reproducing Information		.082	-.017	-.202	.84
Chunking		.075	.329	4.417*	<.001
R-squared			.426		
Adjusted R-squared			.412		
Standard Error of the Estimate		.256			
F(4, 162)				30.04	<.001
Goal Setting	**B**	**SE**	**β**	**t**	**p**
Constant	4.21	.343		1.396	.165
Spaced Repetition		.08	.141	1.757	.081
Generative Learning		.096	.089	.927	.355
Reproducing Information		.092	.253	2.741*	.007
Chunking		.084	.427	5.073*	<.001
R-squared			.469		

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Adjusted R-squared			.456		
Standard Error of the Estimate		.289			
F(4, 162)				35.74	<.001
Problem-solving Abilities	**B**	**SE**	**β**	**t**	**p**
Constant	1.298	.342		3.793*	<.001
Spaced Repetition		.08	.01	.129	.898
Generative Learning		.096	-.015	-.152	.88
Reproducing Information		.092	.332	3.605*	<.001
Chunking		.084	.364	4.334*	<.001
R-squared			.366		
Adjusted R-squared			.35		
Standard Error of the Estimate		.289			
F(4, 162)				23.39	<.001
Self-reflection	**B**	**SE**	**β**	**t**	**p**
Constant	0.619	.367		1.686	.094
Spaced Repetition		.086	.041	.481	.631
Generative Learning		.103	.275	2.67*	.008
Reproducing Information		.099	.11	1.117	.266
Chunking		.09	.439	4.878*	<.001
R-squared			.413		
Adjusted R-squared			.398		
Standard Error of the Estimate		.31			
F(4, 162)				.158	.854

*p < 0.05

The *Reproducing Information*, and *Chunking* have a significant effect to Goal Setting. The F-test of the overall model is significant (F(4, 162) = 35.74 with, p < 0.001), indicating that the regression model is a good fit for the data.

More so, it is evident that the utilization of brain-based teaching approach focused on students' engagement in teaching materials through restructuring and rewriting of concept aids the student's practice of setting learning objectives and academic goals. Agreeing to Plucker et. al. (2014), reproducing information emphasizes learning tried-and-true solutions to current issues in a world that is mostly stable. It doesn't equip students to handle complexity, unforeseen circumstances, or contingencies in a world that is changing quickly. Thinking creatively and critically is largely disregarded. Dewey called this approach to knowledge the spectator perspective. Reproductive Learning perpetuates long-standing oppositions such as knower and known, teacher and student, and theory and practice.

Also, breaking down complex information into easy-to-understand concept leads the learners to absorbed information faster and allow then to identify their learning objectives. Coherent with Miller G. A. (2016), by organizing discrete pieces of information into bigger, more recognizable groups, chunking helps short-term memory. If you want to enhance your memory or remember multiple key points, give chunking a try. By assembling discrete information into a larger whole, one can take advantage of the brain's innate propensity to remember big ideas more vividly than discrete details. This article explains chunking and provides examples, applications, and strategies.

The *Reproducing Information*, and *Chunking* have a significant effect to Problem-solving Abilities. The F-test of the overall model is significant (F(4, 162) = 23.39 with, p < 0.001), indicating that the regression model is a good fit for the data.

Moreover, the integration of brain based teaching approach with emphasis on breaking down complex information into parts with activities that encourage learners to engage in materials that restructure and rewriting concept processed student's ability to perceived problems and provide solution through critical thinking and analysis.

The *Generative Learning*, and *Chunking* have a significant effect to Self-reflection. The F-test of the overall model is significant (F(4, 162) = 28.46 with, p < 0.001), indicating that the regression model is a good fit for the data.

Moreso, the usage of brain-based teaching approach to learners with emphasis on breaking complex information into part as learners perceived its parts creates general understanding of the topic which allowed them to reflect their weaknesses and strength as well as their study habits effect on their academic achievement.

Brain-Based Learning (BBL) was studied to enhance students' self-efficacy. The method, which included brainstorming, i-Think maps, back-to-board, visual storytelling, and kinesthetic orientation, significantly increased students' confidence in their abilities, Amjad et al. (2022)

In this study, the hypothetical question would like to determine the relationship of independent variable particularly the brain-based learning design to dependent variable which happened to be the student's self-efficacy.
The relationship of brain-based learning design and student's outcome were revealed in the following table, which shows the p-value, strength of relationship and verbal interpretation.

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The table presents the results of a multiple regression analysis examining the effect in utilizing Teaching approach to the students' outcomes. The *Spaced Repetition*, *Generative Learning*, *Reproducing Information* and *Chunking* has no significant effect to the Diagnostic Assessment, Summative Assessment and Practical Test. The F-test of the overall model is not significant (F(4, 162) with, $p > 0.05$), indicating that the regression model is not a good fit for the data.

The available research indicates that a brain-based model-focused teaching strategy may not always have an impact on students' application of learning strategies in written and performance tasks. This is due to the fact that different students have different learning styles, which may affect how they participate in activities that target information processing and retention in the brain rather than just their preferred methods of learning. This implies that while strategies to maximize cognitive processing and retention, such active engagement and critical thinking, may be emphasized in a brain-based teaching approach, the efficacy of these strategies may differ based on the preferred learning styles of certain students.

Table 15. Regression Analysis on the Effect in Learning Design to the Students' Outcomes

Diagnostic Assessment	**B**	**SE**	**β**	**t**	**p**
Constant	22.81	4.713		4.839*	<.001
Spaced Repetition		1.1	-.993	-.903	.368
Generative Learning		1.324	2.108	1.592	.113
Reproducing Information		1.27	-1.234	-.971	.333
Chunking		1.157	-1.496	-1.293	.198
R-squared			.04		
Adjusted R-squared			.017		
Standard Error of the Estimate		3.976			
F(4, 162)				1.698	.153
Summative Assessment	**B**	**SE**	**β**	**t**	**p**
Constant	48.36	5.936		8.148*	<.001
Spaced Repetition		1.385	-.63	-.455	.65
Generative Learning		1.668	.749	.449	.654
Reproducing Information		1.6	-1.014	-.634	.527
Chunking		1.457	-1.551	-1.064	.289
R-squared			.026		
Adjusted R-squared			.002		
Standard Error of the Estimate		5.007			
F(4, 162)				1.095	.361
Practical Test	**B**	**SE**	**β**	**t**	**p**
Constant	14.83	1.567		9.465*	<.001
Spaced Repetition		.365	.127	.347	.729
Generative Learning		.44	.339	.769	.443
Reproducing Information		.422	.345	.816	.416
Chunking		.385	-.1	-.261	.795
R-squared			.026		
Adjusted R-squared			.002		
Standard Error of the Estimate		1.321			
F(4, 162)				1.069	.374

*$p < 0.05$

4. CONCLUSION AND RECOMMENDATIONS

In line with the findings of the study it can be concluded that learners highly perceived the use of brain-based teaching approach in science subject in terms of spaced repetition, generative learning, reproducing information and chunking.

On the other hand, Students attained highly perceived their capacity in terms of task accomplishment, set learning goal, problem-solving abilities, and self-reflection. Upon integration of brain-based learning design in the teaching and learning process.

Most of the students attained scores lower than satisfactory level which required more effort to attain satisfactory standard of performance while most students achieved very satisfactory, some were satisfactory and others attained outstanding which attained over the satisfactory standard in summative test.

Meanwhile, Most of the students showed exemplary performance in performance task as they obtained scores higher than satisfactory standards upon exposure in brain based learning design.

There is significant effect in utilizing brain based learning design to the students' self-efficacy. Thus, the posited null hypothesis is rejected. Denoted that the brain based learning design aids the development of student's self-efficacy.

While, finding show that utilizing Teaching approach has no significant effect in to the students' outcomes thus the posited

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null hypothesis stating that There is no significant effect in utilizing teaching approach to the students' outcomes is sustained.

Furthermore, it the brain-based teaching method were viewed by the learners as effective teaching method for science subject as it enhance their competency, efficacy and learning experiences.

Based on the conclusion laid, the following suggestions are offered by the researcher:

1. The school should encourage teachers to used brain-based teaching approach in the discussion of complex topic to aid learners recall of the concept and process long terms retention.
2. Teachers should process students setting of their learning goals to aids the develop learning habits that enhance their problem-solving skills, learning reflection and sense of accomplishment in every task assigned and engagement in the teaching learning process.
3. The teachers should practice drills and recall among learners to increase their performance in written work.

REFERENCE

1. *Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-MethodsResearch: A Discussion on its Types, Challenges, and Criticisms. Journal of Practical Studiesin Education, 2(2), 25-36DOI: https://doi.org/10.46809/jpse.v2i2.20*