IMPACT OF WHOLE BRAIN TEACHING BASED INSTRUCTION ON ACADEMIC PERFORMANCE OF GRADE 11 STUDENTS IN MATHAMATIC

BY
Alroome Hadef Helal

Doi: 10.21608/ejev.2025.450830

استلام البحث : ٢ / ٧ / ٢٠٢٥

قبول النشـــر: ٢٥ / ٨ / ٢٠٢٥

Helal, Alroome Hadef (2025). Impact Of Whole Brain Teaching Based Instruction On Academic Performance Of Grade 11 Students In Mathematics. ***The Arab Journal of Qualitative Education,*** The Arab Institution for Education, Science and Literature, Egypt, 9(39), 591–612.

https://ejev.journals.ekb.eg

Impact Of Whole Brain Teaching Based Instruction On Academic Performance Of Grade 11 Students In Mathematics

Abstract:

Improving students' academic performance requires the teacher's knowledge on different classroom instructions based upon how the brain gathers and stores knowledge. One classroom instruction that engages different parts of the brain in an active instructional setting is a method known as Whole brain teaching. This study was conducted to determine the impact of Whole brain teaching or WBT on academic performance of grade 11 students in Algebra. Quasi-experimental research method, specifically, pretest-posttest with control group using matched- subject design was employed in the study. Two heterogeneous classes were randomly selected and assigned as experimental and control groups. Pretest and posttest were used in measuring the academic performance of the students. The experimental group received instructions using WBT techniques whereas the control group underwent the same pacing and content using conventional teaching techniques. Based on the data gathered, the students' academic performance increased significantly after subjecting them to WBT techniques and conventional teaching techniques. However, results of the posttest comparison of both groups showed that there was a statistically significant difference between the academic performance of experimental and control groups in favor of the experimental group. Thus, Whole brain teaching has a positive impact on academic performance of grade 11 students in Algebra.

Keywords : Academic Performance, Algebra, Brain Based Learning, Mathematics, Whole Brain Teaching

ISSN: 2537-0448 *eISSN: 2537-0456*

المستخلص:

تحسين الأداء الأكاديمي للطلاب يتطلب معرفة المعلّم بأساليب تعليمية صفّية مختلفة، بناءً على كيفية قيام الدماغ بجمع المعلومات وتخزينها. ومن بين هذه الأساليب الصفّية التي تُشرك أجزاءً مختلفة من الدماغ في بيئة تعليمية نشطة، أسلوب يُعرف باسم "التعليم بالدماغ الكلّي .(Whole Brain Teaching) "أُجريت هذه الدراسة لتحديد أثر التعليم بالدماغ الكلّي (WBT) على الأداء الأكاديمي لطلاب الصف الحادي عشر في مادة الجبر. وقد استُخدم المنهج شبه التجريبي، وتحديدًا تصميم "الاختبار القبلي–البعدي" مع مجموعة ضابطة باستخدام أسلوب المطابقة بين الأفراد. تم اختيار شعبتين غير متجانستين عشوائيًا وتوزيعهما كمجموعة تجريبية وأخرى ضابطة. استُخدم الاختبار القبلي والبعدي لقياس الأداء الأكاديمي للطلاب . تلقت المجموعة التجريبية تعليمًا باستخدام تقنياتWBT ، في حين خضعت المجموعة الضابطة لنفس الوتيرة والمحتوى باستخدام الأساليب التقليدية. وبناءً على البيانات التي تم جمعها، تحسن الأداء الأكاديمي للطلاب بشكل ملحوظ بعد تعرّضهم لكلٍّ من تقنيات WBT وأساليب التدريس التقليدية. ومع ذلك، أظهرت نتائج المقارنة في الاختبار البعدي بين المجموعتين وجود فرق دال إحصائيًا بين أداء المجموعتين لصالح المجموعة التجريبية. وبالتالي، فإن التعليم بالدماغ الكلّي له أثر إيجابي على الأداء الأكاديمي لطلاب الصف الحادي عشر في مادة الجبر.

الكلمات المفتاحية :الأداء الأكاديمي، الجبر، التعلّم القائم على الدماغ، الرياضيات، التعليم بالدماغ الكلّي.

Introduction

The importance of mathematics is universally valued as many aspiring careers require a solid foundation in this subject. However, Emeriti students have low achievements in this subject as reflected in national and international exams like National Achievement Test or NAT (Fernandez, 2013) and Trends in International Math and Science Study or TIMSS (Alpacion, Camañan, Gregorio, Panlaan, & Tudy, 2014). This has become a cause of great concern of the educational sector in the United Arab Emirate . According to Magno (2011), one contributory factor in Emiratis students' low academic performance is the limited specification on how instruction is delivered and the strategies used in the teaching and learning

ISSN: 2537-0448 *eISSN: 2537-0456*

process. In secondary level, English is the only subject that specified the teaching strategies and the type of instruction to be used. This has seen as necessary in other fields especially in mathematics due to the complexity of skills that needs to be learned. Likewise, Algebra, as a math discipline, is considered as one of the most abstract (Egodawatte, 2011). Due to its complexity and abstract nature, Algebra has the most number of least-mastered contents among the three learning areas in K to 12 grade 11 mathematics curriculum (Capate & Lapinid, 2015). Thus, it stirred the mind of educators and researchers to explore on appropriate classroom instructions and strategies that can inhibit the difficulties encountered by students in Mathematics, especially in Algebra. Recommendations from brain research might be one means of promoting higher levels of learning and greater academic achievement (Darling-Hammond, 2007), as cited in Richardson, (2011).

This research needs to be translated into brain-based learning strategies that can be used by educators. Brain-based learning is the engagement of strategies based on principles derived from information on how brain learns best to promote meaningful learning (Hakim, Cahya, Nurlaelah, & Lestari, 2015). These strategies can be used to elevate teachers' instruction and increase students' capacity to learn using ways in which they feel most comfortable. One strategy that was established according to the principles of Brain based learning is Whole brain teaching or WBT. It is formerly known as Power Teaching introduced by Chris Biffle in 1999. Classroom problems such as student misbehavior and disengagement with the lesson brought about by lecture method led to the development of Whole brain teaching as amethod which promotes activities that engage different parts of the brain. It is a classroom instruction and strategy that uses a variety of

ISSN: 2537-0448 eISSN: 2537-0456

techniques which incorporates gestures and sounds to stimulate the learner to think and learn.

Whole brain teaching is composed of seven core teaching techniques known as the Big Seven. These are Class-Yes, Five Classroom Rules, Teach- Okay, Switch, Scoreboard, Hands and Eyes, and Mirror. Advocates of WBT believed that the use of these techniques in the classroom improves students' engagement, motivation, behavior and academic achievement (Biffle, 2013). The Whole brain or commonly referred to as Power teaching was developed by three teachers in Southern California namely Chris Biffle, Chris Resktad and Jay Vanderfin as a grass root education reform movement that began in 1999. Since its inception, power teaching was joined by dedicated group of K-12 educators that formed its executive board (Wholebrain Teaching, 2018). The main goal of power teaching was to create classrooms that are peaceful but also full of orderly fun. Power Teaching advocators claim that several educators have benefited from the adaptation of Power Teaching techniques. In this perspective, the study proposes to investigate whether the promised benefits made by Power Teaching are realized in practice.

Theoretical/ Conceptual Framework

A theory that supports the principles of Brain based learning is Whole Brain Theory by William Ned Hermann (Inocian, 2015). He created a whole-brain model which is metaphorically illustrated using a circle divided into four quadrants to classify the learners according to their preferences for thinking and learning in the four quadrants.

ISSN: 2537-0448 *eISSN: 2537-0456*

Figure 1: Hermann's Whole-Brain Model

According to Hermann, if a person develops a very strong preference for learning in one or two quadrants, he may reject learning on the other quadrants. Thus, his theory stresses the importance of utilizing the strengths and attending to essential weaknesses in all learners by providing equal learning opportunities for different learners, where each of the four learning styles (A, B, C, and D) were fulfilled in a single lesson (Bawaneh, Md Zain, & Saleh, 2011). It can be attained by using various methods, alternating with techniques and activities to address each of the four quadrants (Herrmann-Nehdi, 2002). It encourages whole-brain development as learning complex tasks involve a widely distributed network of brain areas (Worden, Hinton, & Fischer, 2011). Whole brain teaching is anchored on this theory as it supports the idea that learner learns best when his whole brain is involved. Using a whole-brain approach to teaching and learning helps to reach and engage diverse learners, improve their retention and deliver memorable learning experiences (Herrmann-Nehdi, 2009). Enlightened by Hermann's Whole brain theory, the researcher conceptualized a paradigm patterned after the Input- Process- Output model to illustrate the relationships of the variables and the research process of the study.

ISSN: 2537-0448 eISSN: 2537-0456

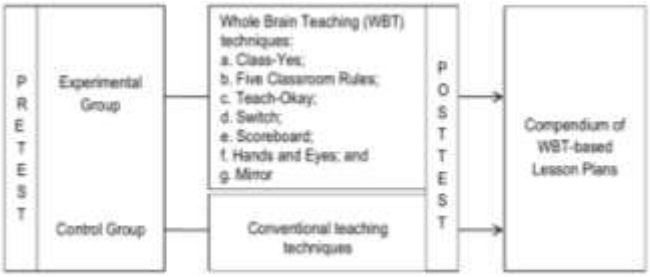

Figure 2: Paradigm of the Study

As presented in Figure 2, the input variables include the pretest and the respondents (experimental and control groups) of the study. The pretest was used to assess the performance of the students by comparing it with the posttest. The experimental and control groups were comprised of heterogeneous students to test the impact of WBT techniques to diverse learners. The process employed the kinds of instructions used for the experimental group which are WBT techniques and the control group which are conventional teaching techniques. After which, a posttest was administered to measure the academic performance of the students as a result of the kind of instructions used. The output variable is the compendium of WBT-based lesson plans which can be used by novice teachers in whole brain teaching techniques for teaching selected topics in grade 11 Algebra.

Problem Statement

This study aimed to determine the impact of Whole brain teaching on academic

performance of grade 11students in Math at Almottahida High School from October 24 to November 26 of school year 2018- 2019The Whole Brain Teaching promises that using Power Teaching method, allow educators to accomplish a positive and effective classroom, where learning is fun for both students and teaching. As the learning is based pedagogical

ISSN: 2537-0448 *eISSN: 2537-0456*

theory, it can result in higher retention, greater involvement of students however, educators applying whole brain teaching might face irritated colleagues (Whole Brain Teaching, 2018). Teachers all over the world face common difficulties in teaching the prominent being lack of student discipline, lack of problem skills and background knowledge of students. Many students from kindergarten to college face difficulty in writing and reading however with Power Teaching students can overcome these challenges, enjoy learning through well-designed learning games, and make significant progress in their education (Whole Brain Teaching, 2018). Coe, et al. (2014) state that great teaching is associated with the improvement of students' performance. Therefore, this research will analyze the impact of Power Teaching on students' performance and behavior and it effectiveness in improving students' performance.

Background and Significance

In the recent Programm for International Student Assessments (PISA) test and Trend of International Mathematic and Science Study (TIMSS), it was revealed that students of UAE scored lower on international tests compared to average of other student's world over. In the last few years, student's performance has deteriorated compared to last decade (Zaman, 2018). Zahran, et al. (2016) study revealed that though educational attainment in UAE has improved significantly over the years in UAE there are however major challenges that the UAE education sector need to overcome these are educational leadership, reforms in education system and teaching methods and improving student performance is the need of the hour. In 2016, Ministry of Education has undertaken curriculum reform mainly aimed towards enhancing student's performance to enhance student's readiness for job competitiveness and higher education (Pennington, 2016). However, the founder of Learning

ISSN: 2537-0448 eISSN: 2537-0456

without Frontiers Graham Brown-Martin, stated that to improve student's performance in the UAE more experiential based education is needed and there is strong case for education reform which requires teachers to understand how to motivate students to learn (Hanif, 2017). These reports call for the implementation new teaching methods in UAE schools. Though there is so much talk about new methods and concepts in teaching aimed improving student's performance, it is however important to note that not all teaching methods are as effective as acknowledged. This study is significant because it aimed at analysing the effectiveness of Power Teaching in improving students' performance and whether it delivers the promises it claims. The results will help make informed decisions about the implementation of power teaching technique in schools and colleges in UAE so as to improve students' performance.

Objectives of the Research

The main objectives this research aims to achieve are

RO1: To analyze what is Whole Brain Teaching and identify what it aims to accomplish.

RO2: To evaluate the impact of Whole Brain Teaching on Student's performance?

RO3: Based on the results recommending strategies in implementing Whole Brain teaching if it is effective in improving student's performance.

Questions

specifically, the study sought to answer the following questions:

What is the academic performance in Algebra as reflected in the pretest and posttest ?

mean scores of the students taught using:

- Whole brain teaching techniques; and
- Conventional teaching techniques?

ISSN: 2537-0448 *eISSN: 2537-0456*

Is there any significant difference between the academic performance in grade 11 ?

Algebra as indicated by pretest and posttest mean scores of the students taught using:

- Whole brain teaching techniques; and
- Conventional teaching techniques?

What is the impact of WBT-based instruction in Grade 11Algebra?

Research Hypothesis

H1: Whole brain teaching has positive impact on students' performance.

H2: Whole brain teaching positively affects the behavior of students and motivates them resulting in better learning.

Literature Review

Kelso (2009) is a teacher who is an intern in Professional development school and works as a teacher for fifth grade classroom in Park Forest Elementary school. She conducted a study on the evaluation of the impact of power teaching on performance of students. She implemented Power Teaching in her class and compared the results by taking a survey before and after the implementation of Power teaching. Her study concluded that only two of the claims of Power teaching were effective in classroom management however, one claim that it helps in improving reading skills of students were found to be ineffective. She concluded that Power teaching results in increased response of students, decreased their reaction time and helped in creating maximized instruction time. The Power teaching also helped in motivating students to respond to attention getting strategies however the Crazy Professor Reading Game of power teaching decreased reading fluency of students and does not help in improving overall aspects of reading skills of students.

ISSN: 2537-0448 *eISSN: 2537-0456*

In another study by Putranto (2015) conducted a study involving VII class students of SMP Negeri 1 Mayong Jepara school in Indonesia. The study covered 40 students who were facing difficulties in speaking and understanding English subject. The main objective of the study was to understand whether Power teaching approach implementation in the class increases student's participation in speaking English and discussion and explaining the process of Power teaching approach implementation in the classroom. The study concluded that Power teaching approach implementation, though was not effective and teachers faced some problems initially, they were able to better manage the class and all students participated in speaking English as they were encouraged to interact, get involved in discussion which led to students actively participating in speaking English which was not the case before implementation. The research concluded that Power Teaching is effective in enhancing student's performance as it can make students take interest in the learning and teaching process and motivated them to learn English language.

The quality and effectiveness of classroom instruction are imperative to lessen problems associated to teaching and learning mathematics (Dursun & Dede, 2004 as cited in Andaya, 2014). Thus, it is the role of the teacher to look for a classroom instruction that would address this need.

Brain based learning is a new pedagogy that maximizes students' brain capacity foremotional, social, cognitive, physical and reflective learning (Sesmiarni, 2015). Teachers should use brain-based instructional activities that are proven to increase students' capacity to gather and store knowledge (Sanchez, 2017) and increase students' academic performance (Sousa, 2008; Adebayo, 2005; Lucas, 2004; Lackney, 2003, cited in Awolola, 2011). Studies by Awolola

ISSN: 2537-0448 *eISSN: 2537-0456*

(2011), Rehman, Malik, Shafqat, Zafar, & Muhammad (2012) and Elsayed (2015) proved that Brain based learning and teaching method enhanced students' achievement in mathematics more than the conventional teaching method. In terms of enhancing the mathematical communication and mental arithmetic, the study of Khattab (2013), as cited in Al-Tarawneh (2016), showed no statistically significant difference between the students taught via brain based learning with that of the students taught via conventional way of teaching. One Brain based learning pedagogy is Whole brain teaching which is believed to be effective in the teaching and learning process in terms of capturing students' interest, sustaining their attention, improving their behavior, and increasing their engagement and motivation.

It was supported by the study of Armijo (2009), as cited in Lockhart (2016). Research proves that these factors have direct correlation with student achievement which may be an indicative that WBT has a positive effect on student achievement. Several researches proved that academic self-concept is directly related to academic performance in mathematics (Ghazvini, 2011). As to the effect of WBT in students' self-concept, no evidence was found that it affects students' overall academic self-concept (Clark, 2016). In terms of determining the effects of WBT techniques to the academic performance of students in mathematics, a positive effect was found in the study of Armijo (2009), cited in Lockhart (2016) which was done by analyzing the Academic Performance index of the school before and after the implementation of WBT. On the other hand, a negative effect was found on the study of Lockhart (2009), cited in Lockhart (2016) which was done by analyzing the students' grades before and after the use of WBT. This indicates that further studies must be conducted. Moreover, the designs of their researches were not experimental.

ISSN: 2537-0448 eISSN: 2537-0456

In the Philippines, Torio & Cabrillas-Torio (2015) revealed a 20% learning gain to the academic performance of mathematics students which can be derived from the use of WBT. The study made use of Quasi-experimental design but was done in the field of Math.

In addition, Battle (2010) also claims that Whole Brain teaching helps new teachers in managing classrooms less stressful and makes interaction fun for both teacher and student. Battle (2010) argues that student's performance enhances because the whole brain teaching approach is designed towards the maximization of students engagement in class and allows for student to focus on the way their brain is really designed. SOURCE Learning is very effective in this approach because it is flexible and integrates classroom management with effective techniques of teaching, thus giving new teachers tremendous advantage over others.

The brief literature review suggest that whole brain teaching improves class room management and students response, At the same time increasing student attention in the class room setting Thus leading to the improvement of Algebra skills. However, a more in-depth research is needed to fully assess the impact of whole brain learning on students' performance.

The fact that there are only a number of recorded studies on Whole brain teaching implies that this teaching pedagogy has not yet captured much attention. With these the researcher sees the solution with the utilization of WBT techniques as revealed by various studies.

Methodology

Research Design

The research design will be mixed methodology that includes quasi experiment, survey (provided to the teachers and

ISSN: 2537-0448 *eISSN: 2537-0456*

experimental group) the experiment will compare two treatment groups (White & Sabarwal, 2014). Specifically, pretest-posttest design with a control group. This design was preferred because the experimental and control groups were naturally assembled groups as intact classes. Matched-subject design was employed to increase the probability that the two groups are equivalent. (22) pairs of individuals in each group were selected as respondents who were mechanically matched using their general weighted average in mathematics 11. After the matching was completed, the choice of which group will be the control and which will be the experimental was done randomly.

Setting, Population, Sampling, and Respondents of the Study:

This study took place at Almuttahida High School where the researcher is currently working as vice principal . The school has the largest students' population among the Aldhafra region . The school's National Achievement Test (PISA)) results in Mathematics showed PISA results can be further analysed according to 6 defined proficiency levels that are ranked in ascending order, reflecting the skills expected of students at age 15. The proportion of UAE students who achieved Level 3 proficiency, the level considered by the OECD as necessary for students to succeed in the knowledge economy, ranged from 23% in problem solving to 36% in reading .These 15-year old students are ready to fully participate as productive, engaged and reflective citizens, both locally and globally. These results show that less than 13% of UAE students were able to meet Level 4 across all domains. At the same time, the analysis shows that a proportion of students ranging across domains from 2% to 3% of students in the UAE can be considered highly proficient on a global scale. On the other hand, substantial support is required for the students unable to achieve Level 2. This was found to

ISSN: 2537-0448 eISSN: 2537-0456

encompass over one-third of the UAE student population at age 15 in reading and science and approximately half of that population in mathematics and problem solving.

The population of the study was consisted of grade 11 students .. The researcher handles four (4) heterogeneous classes. Out of these four (4) classes, two (2) classes were randomly selected using the fishbowl method as well as in determining which will represent the control group and the experimental group. The respondents were sections 11-B and 11-C. Section 11-B has (22) students while section11-C has (24) students. However, to increase the probability that the two classes are of equivalent performance prior to the conduct of the study, all the students in each class were selected through matched- pairing using their general weighted average in the previous grade level. Each respondent in the control group has a corresponding respondent in the experimental group with the same general weighted average in mathematics 11 in same Mathamatic unit .

Research Instrument

Pretest and posttest were used in measuring the academic performance of the students. First, the researcher constructed a Table of Specifications and a 60-item multiple choice type of test. The test is about Algebra which covers the topics Factors of Polynomials and Rational Algebraic Expressions. Experts' opinions were sought for the validity of the test. Then, it was administered to one section of Grade 11 with (44) students who had their Mathematics 10 in the previous year for pilot testing. The test was subjected to item analysis to determine the 40 items that will be considered in the final draft. Kuder-Richardson's formula 20 was used to determine the internal consistency and a reliability coefficient of 0.82 was obtained. The same tool was administered as pretest at the start and posttest at the end of the

ISSN: 2537-0448 *eISSN: 2537-0456*

treatment but the items were disarranged to avoid the effect of practice.

Preliminary Suppositions and Implications

In UAE scholars, educationist are calling for reforms in education system and teaching methods to improve students' performance. Though education system in UAE is improving, more reforms and innovative teaching methods and approaches are required to improve students' performance and make them competitive for jobs and make them on par with international standards (Hanif, 2017). However though different approaches offer many advantages, not all approaches are effective or beneficial. Therefore, the results of this study will have great implications for teachers, policy makers and educational leadership in making informed decisions on the implementation of whole brain teaching approach and its effectiveness in improving students' performance. It will also offer teachers the opportunity of learning new concepts and government spending of time and money on programs that improve student performance.

Results and Discussion

Results on the academic performance in Algebra as reflected in the pretest and posttest mean scores of the students taught using:

- Whole brain teaching techniques.
- Conventional teaching techniques.

Table 2: Pretest and Posttest Scores of Experimental Group

Score	Pretest	Posttest	Description
Mean			

ISSN: 2537-0448 eISSN: 2537-0456

Table 3: Pretest and Posttest Scores of Control Group

Score	Pretest	Posttest	Description
Mean			

Results on the significant difference between the academic performance in grade 8 Algebra as indicated by pretest and posttest mean scores of the students taught using:

- Whole brain teaching techniques
- Conventional teaching techniques.

Table 4: Comparative Analysis of the Pretest Mean Scores of the Experimental and the Control Groups

	Experimental	Control
Mean		
Mean Difference		

Conclusion

The research proposes to investigate the impact of Whole Brain teaching approach on the performance of students'. It is an innovative and contemporary approach that seeks to improve classroom management, teachers' ability to better engage and interact with students, reduce student's response time and motivate them to learn better. The approach has gained momentum and has been equally used by many teachers around the world. However, there is little academic research that supports this claim, therefore more research is needed to evaluate the impact of whole brain teaching on performance of students and their behavior, which this research proposes to do.

In conclusion, it has been found and proven that the Brain Based Teaching Approach is effective in encouraging conceptual understanding of Mathematic among students. Results obtained have shown that there was a significant difference between the

ISSN: 2537-0448 *eISSN: 2537-0456*

achievements of conceptual understanding for students that followed the Brain Based Teaching Approach as compared to those who followed the conventional teaching method. The brain based learning group obtained a significantly higher Mathematic conceptual understanding score as compared to the conventional group. Therefore, it is concluded that the Brain Based Teaching method is effective in dealing with students' conceptual understanding of the subject of Mathematic in schools.

Recommendations :

Conventional teaching method can be used regularly with integration of Whole brain teaching techniques as these methods are both effective in increasing the academic performance of the students in grade 11 Algebra. Grade 11 mathematics teachers are encouraged to adapt and use as reference the Compendium of WBT-based lesson plans developed by the researcher as it may inspire them to use and apply the seven core teaching techniques of WBT in their Algebra class. It may also help them acquire the necessary skills to reach diverse learners in the classroom successfully and make Algebra a fun subject to learn.

School administrators should provide faculty development seminars that would venture on the discovery of an innovative and effective teaching pedagogy like Whole brain teaching that could enhance teaching and learning and help the school in achieving its vision, mission, goals and objectives.

The study was carried out for one quarter. Therefore, the longitudinal impact of WBT on students' academic performance must be examined. Since the students will be exposed to WBT techniques for a longer timeframe, they will have a better understanding of which techniques help them learn and which ones are effective in improving learning. Practicing the use of

ISSN: 2537-0448 eISSN: 2537-0456

these techniques may lead to a natural way of learning which in turn, improved their test scores.

Therefore, the results of this study could not be generalized to a broader scope. An in-depth study with a larger number of respondents can be done to further conclude the impact of Whole brain teaching method in students' academic performance in Math.

Whole brain teaching does not center solely on Big Seven. Teachers can venture on other WBT techniques to actively engage the students with different learning styles by incorporating many different teaching techniques into one lesson. Moreover, similar studies can be conducted in the elementary and tertiary levels, in other subjects, as well as in other parameters to further prove the usefulness of Whole brain teaching method.

ISSN: 2537-0448 *eISSN: 2537-0456*

References:

Alpacion, N. D., Camañan, C. T., Gregorio, A. L., Panlaan, J. R. & Tudy, R. A. (2014). Attitude, Self-Efficacy and Students' Academic Performance in Mathematics. IAMURE International Journal of Social Sciences. https://doi.org/10.7718/ijss.v12i1.920

Al-Tarawneh, M. (2016). The Impact of a Teaching-Learning Program Based on a Brain-Based Learning on the Achievement of the Female Students of 9th Grade in Chemistry. Higher Education Studies, 6(2), 162. https://doi.org/10.5539/hes.v6n2p162

Andaya, O. F. (2014). Factors that Affect Mathematics Achievement of Students of Philippine Normal University-Isabela Campus. International Refereed Research Journal, 5(4).

Awolola, S. A. (2011). Effect of Brain Based Learning Strategy on Students' Achievement in Senior Secondary School Mathematics in Oyo State, Nigeria. Cypriot Journal of Education Science, 2, 91-106.

Bawaneh, A. K. A., Md Zain, A. N & Saleh, S. (2011). The Effect of Herrmann Whole Brain Teaching Method on Students' Understanding of Simple Electric Circuits. European Journal of Physics Education, 2(2).

Battle, J., (2010), Whole Brain Teaching: Learning the way the Brain is designed, *Teachers of the Future*, Fall 2010 Issue, Retrieved 30 Sep, 2018 from https://www.advanc-ed.org/source/whole-brain-teaching-learning-way-brain-designed.

Biffle C. (2008), Whole Brain Teaching(Power Teaching) Lesson 1, *YouTube Video*, Retrieved 28 Sep, 2018 from https://www.youtube.com/watch?v=W1kxpBPtqyI.

ISSN: 2537-0448 *eISSN: 2537-0456*

Biffle, C., (2013), *Whole Brain Teaching for challenging kids (and the rest of your class, Tool)*, 1st Ed, Whole Brain Teaching LLC.

Bryman, A. (2016). Social Research Methods 5th edition London: Oxford University Press.

Coe, R., Aloisi, C., Higgins, S., and Major, L.E., (2014), What makes great teaching? : Review of the underpinning research, *Centre for Education and Monitoring*, Retrieved 1 Oct, 2018 from https://www.suttontrust.com/wp-content/uploads/2014/10/What-makes-great-teaching-FINAL-4.11.14.pdf.

Hanif, N., (2017), Education reform needed to meet future challenges, *The National*, Retrieved 1 Oct, 2018 from https://www.thenational.ae/uae/education/education-reform-needed-to-meet-future-challenges-1.47604.

Kelso, A., (2009), Power Teaching: How Powerful is It, *Park Forest Elementary*, Retrieved 27 Sep, 2018 from https://ed.psu.edu/pds/teacher-inquiry/2009/kelsoa.pdf.

Pennington, R., (2016), Education reforms put UAE pupils on track for better learning, *The National*, Retrieved 1 Oct, 2018 from https://www.thenational.ae/uae/education/education-reforms-put-uae-pupils-on-track-for-better-learning-1.139060.

Putranto, M.Y., (2015), The implementation of power teaching approach in increasing the speaking participation of VII class of SMP N 1 Mayong Jepara in 2015/2016, Thesis Report, *University of Muria Kudus*, Retrieved 30 Sep, 2018 from http://eprints.umk.ac.id/5794/1/COVER.pdf.

Sekaran, U. and Bougie, R. (2016). Research Methods For Business: A Skill Building Approach Seventh Edition. 1st edition. John Wiley & Sons.

ISSN: 2537-0448 ***eISSN: 2537-0456***

Vanderstaay, S.L., Faxon, B.A., Meischen, J.E., Kolesnikov, K.T., and Ruppel, A.D., (2009), Close to the heart: Teacher Authority in a classroom community, *National Council of Teachers of English*, Vol.61 (2), p. 262-282.

Walliman, N. (2011). Research methods: the basics. London, Routledge.

Whole Brain Teaching(2018), About Us, *Whole Brain Teaching.com*, Retrieved 29 Sep, 2018 from https://wholebrainteaching.com/about-us/.

Zahran, R., Pettaway, L.D., Waller, L.R., and Waller, S., (2016), Educational leadership: challenges in United Arab Emirates, *The Global eLearning Journal*, Vol.5 (1), p.1-8.

Zaman, S., (2018), UAE students still not performing well on international tests, *Gulf News*, Retrieved 1 Oct, 2018 from https://gulfnews.com/news/uae/education/uae-students-still-not-performing-well-on-international-tests-1.2217721.

ISSN: 2537-0448 *eISSN: 2537-0456*