



Effectiveness of Whole Brain Teaching Style in Enhancing the Academic Performance of Grade 11 Students in General Chemistry I

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Abstract

This study aims to determine the effectiveness of Whole Brain Teaching (WBT) Style in enhancing the academic performance of students of Don Ramon E. Costales Memorial National High School, Villasis, Pangasinan, Philippines in General Chemistry I. The study reveals that: (1) WBT Style is an effective instructional strategy which enhanced the academic performance of students in General Chemistry I; (2) there was a significant difference between the performance of students taught using WBT Style and students taught using the traditional method in terms of their posttest mean scores; (3) there was a significant difference in the mean scores change of the students after the WBT style was implemented. Results of the study shows that students enjoyed the WBT style of teaching. They also said that it was a fun method and it kept them alert in class. The students preferred the WBT style than the usual lecture-discussion type of teaching.

Keywords: Whole Brain Teaching, academic performance, effectiveness, mean scores, science curriculum, General Chemistry I, pretest, posttest.

Introduction

Obtaining scientific knowledge entails locating information, determining what information is needed, determining where information can be discovered, and determining how information may be acquired. Understanding scientific knowledge, on the other hand, entails the synthesis and development of operational meanings from data. The goal of the science curriculum, according to the K to 12 Curriculum Guide Science (2013), is to produce scientifically literate citizens who are informed and active participants in society, responsible decision-makers, and apply scientific knowledge that will have a significant impact on society and the environment. Specifically, the science curriculum is designed to enhance three

learning domains of the students. These are performing scientific processes and skills, understanding, and applying scientific knowledge, and developing scientific attitudes and values.

Therefore, policymakers and technocrats are thinking of the strategies and methods in order to cater to the unlimited needs of students, and the changing trends with the context of school life. On the other hand, the totality of K to 12 Basic Education Curriculum implementation particularly the Grade 11 Science gradually pushes through in its fifth year of implementation during the school year 2017-2018. However, the difficulty of the subjects integrated in all grade sciences increases relevant to its spiral progression.

Chemistry is the science subject taken by third year students under the Restructured Basic Education Curriculum which lasted school year 2013-2014. In the new K to 12 Basic Education Curriculum, chemistry is included in all the Junior High School sciences such that it reappears in progression as to different quarters of each junior grade level. For Grade 11, General Chemistry I is taught for second semester and for Grade 12, General Chemistry II is taught in the second semester too.

The second quarter of Grade 9 Science entitled "Matter" includes: a) Chemical Bonding; b) Variety of Organic Compounds; and c) Mole Concepts and Calculations. Furthermore, General Chemistry I is offered for Grade 11 students in their second semester of schooling. Since the topics in chemistry are primarily taught in abstraction by most of the teachers as to technicalities relevant to each lesson, sustaining the interest of the students to learn and transfer of learning foremost should be considered.

Students' motivation indeed, as seen by the researchers, is an important factor of tracking a good academic performance record by a student regardless of the subject's difficulty. According to Orleans, in a study funded by Hiroshima University, the condition of physics and chemistry education in the Philippines has recorded a recent substantive development. However, it is delimited because of the deficiency of facilities foremost by the abstraction of the concepts presented with each (Orleans, 2007). This view in an international perspective has been supported with the national results mainly enjoined with the performance results of each of the high schools in the school year 2012-2013 and 2013-2014.

It is crystal clear in the perspectives of the researchers that the difficulty of the subject can be traced five years back based on the academic records kept by the school. Low performance in abstract subjects like chemistry has also been reflected by the Mean Percentage Scores (MPS) targeted a

percentage increase of 2% which were not obtained by Don Ramon E. Costales Memorial National High School (DRECMNHS) in the school years 2012-2013 and 2013-2014. The Mean Percentage Scores of chemistry students in SY 2012-2013 and 2013-2014 were 82.22 % and 81.12% which means it is a deficit of 1.1 % to attain the target of 2%.

Moreover, as the K to 12 Spiral Progression elevates across the levels, the Mean Percentage Scores obtained by science teachers of Grade 8 Science for school year 2013-2014 showed and reflected that chemistry, as incorporated in the third quarter, has the 2nd lowest MPS among others as an indicator of the readiness of Grade 8 Students to take up Grade 9 Science particularly chemistry as an integrated subject for school year 2014-2015. Moreover, the MPS obtained in the second quarter of school year 2014-2015 Grade 9 Science is the lowest among others, a predicament of the difficulty in chemistry as an integrated subject. Furthermore, the results of the 2015-2016 Diagnostic Test conducted among thirteen (13) Grade 9 Sections have shown that seven among the ten (10) items with the least correct responses are chemistry-based pre-requisite questions.

In the conduct of First Periodic Tests in General Chemistry I, for Grade 11 STEM students for school year 2016-2017 marked a mean score of 35.88 and 42.84 on the Second Quarter Periodic Tests.

These data attained simply reveals that mastery learning in chemistry was low due to factors that govern learning and teaching such as of lack of meaningful strategy to teach the subject. Low retention rate is an offshoot of the lack of meaningful experiences due to the traditional approach in teaching the subject. Lack of concrete conceptualization of lessons brought about by the uninteresting mode of instruction. Inadequate and inappropriate teaching aids is also one of the factors. It is in this premise where there is a need to look into possible ways and means on how the students of

DRECMNHS can acquire the skills, knowledge, and information that will enrich and enhance their performance particularly in General Chemistry I to be taught in Grade 11 on the second semester.

Whole Brain Teaching Style

Students of the 21st century are now totally different from before. The attention span for listening using the standard “lecture method” has been shortened and students have become impatient in just listening to their teachers. Thus, the need for an active learning situation, which made the researchers think of conducting a study on the effectiveness of WBT Style. The WBT has its framework built in the philosophy of Sir Benjamin Franklin which states “Tell me and I forget, teach me and I remember, involve me and I learn”. WBT is a methodology that does not focus on assessments, instead focuses mainly on getting students involved in direct instruction. It addresses the use of project assessments versus formative and summative formal tests. The proponent of the methodology, Dr. Chris Biffle, gives emphasis that WBT can be adapted to any age level and any group of students in any place. The WBT uses the Big Seven steps which include “class-yes”, “classroom rules”, “teach-ok”, “scoreboard game”, “hands and eyes”, “mirror”, and “switch” (Biffle, 2013; Tipton, 2017).

“**Class-Yes**” serves as the attention-getter. The teacher says “class” in variations according to pitch (high-low), speed (fast-slow), repetitions (once-many), gestures (none-small-dramatic). However, the teacher varies the utterance of “class” and the students say “yes” in the same manner the teacher does it. To the teacher, it is an entertaining technique to gain students’ attention. To the students saying “yes” amplifies the teacher’s request for attention thus making this a program in students’ brains to receive instruction. It is used to start the lesson, control the crowd, and interrupt class activity (Biffle, 2013; Tipton, 2017).

“**Classroom rules**” serves as an organizer. It refers to the five (5) rules the class must rehearse once a week as follows.

- a) Rule 1: Follow directions quickly
- b) Rule 2: Raise your hand for permission to speak
- c) Rule 3: Raise your hand for permission to leave
- d) Rule 4: Make smart choices
- e) Rule 5: Keep your dear teacher happy! (Biffle, 2013; Tipton, 2017).

“**Teach-Okay**” is the whole brain activator. It follows the maxim “the longer the teacher talks; the more students are losing”. The Teacher speaks briefly, using gestures, usually no more than 30 seconds to one minute. Then claps hands (one to five times) and say, “Teach!” The students repeat hand clap, and say “Okay!” Then they make a full body turn to their neighbor and, using gestures, they teach their neighbor what the teacher have just taught the class. While students are teaching each other, the teacher checks for comprehension. All students should be gesturing! Students listening, mirror the gestures of students speaking (Biffle, 2013; Tipton, 2017).

“**Scoreboard**” serves as the motivator. It keeps the students intensely involved. The teacher makes a smiley/frowny diagram on the front board with Teacher VS Students Challenger. When students are on task, mark a smiley point. Then point at them; they clap their hands and exclaim, “Oh, yeah!” When students are off task, mark a Frowny point. Then point at them and students lift their shoulders and groan, “Ughhhhh!” (Biffle, 2013; Tipton, 2017).

“**Mirror words**” is the class unifier. The class can deeply be involved in the lesson by holding up your hands, ready to make gestures. The utterance of the word “mirror” by the teacher shall be repeated by the students. They are expected to mimic the gestures of the teacher upon the delivery of the lesson. When the teacher says “mirror off”, mimicking stops. The usage of this

technique activates the motor and visual cortices of the students' brain. The highest memory retention can be attained if the motor cortex of the brain is engaged to do more than that of the Wernicke's area of the brain that focus more on talking thus leading to the lowest memory retention (Biffle, 2013; Tipton, 2017).

"The hands and eyes" is the focuser. This step is used at any point during the lesson when the teacher wants students to pay "extra attention" to what he/she is saying/doing. To begin this process, the teacher says, "Hands and Eyes!" and the students respond by mimicking the words and movements of the teacher (Biffle, 2013; Tipton, 2017).

"Switch" is the involver. This step is to be used with the "Teach-OK" step, while students are teaching it is imperative that the same student not teacher every time. Therefore, in order to get every student involved in the lesson, the teacher will direct the students to "Switch!" the students will respond by saying "switch" and the "teacher" of the group will rotate. In here, chronic talkers learn listening skills, and chronic listeners learn speaking skills (Biffle, 2013; Tipton, 2017).

Conceptual Framework

Whole Brain Teaching Style is framed from researches on how the brain works at its best especially on learning. According to Jill Bolte Taylor as cited by Hermann –Nehdi, page 38 in his book *"My Stroke of Insight"* and as retrieved from a file of WBT URL, "Although each of our cerebral hemispheres processes information in uniquely different ways, the two works intimately together when it comes to just about every action we take." Thus, current research suggests that the historical approach to learning, right brain, and left brain is no longer applicable. Whole Brain Teaching Style is framed further on constructivist point of view concerning Vygotsky's Social Learning theory. Therefore, putting the students in control of their own learning (Charles, I. & Chen, L,

2017).

This study came out for possible solutions to be undertaken in order to deal effectively in addressing the difficulties of Grade 11 STEM students particularly in chemistry. Likewise, it could help teachers in the secondary schools to identify appropriate classroom management and teaching styles that would eventually improve their learning effectiveness and efficiency in the aspects of their teaching strategies, techniques, and policies with regards to facilitating learning. Thus, the researchers thought it wise to conduct this kind of study, which is a common practical problem of all science teachers in the different junior grades and is being experienced now in the senior years.

In a meaningful deliberation of a lesson and in a teaching-learning situation, materials to be used must be an aid to facilitate learning. According to Jones (1979) in a file retrieved from WBT URL "Teaching should encompass different alternative delivery options (materials, media, and methods) allowing teachers to become facilitators instead of broadcasters of new information." WBT, in the 21st century classroom, incorporates music, dances, singing, chants, and technology-based projects. According to Lindstrom (2010), "The goal is to liven up lessons with zany and upbeat actions and sayings while placing a major emphasis on students and immediately re-teaching information to their peers." Whole Brain Teaching centers on the use of active learning and rituals in the classroom where students become the teachers and teachers become merely "facilitators of learning" (Charles, I. & Chen, L, 2017).

According to Tipton (2017), WBT is a new "radical" idea; however, it is nothing more than tried and true teaching practices, combined into a new approach. WBT combines direct instruction, sharing and immediate feedback to become a new style of teaching. WBT surmounts to seven steps that a teacher incorporates into his everyday classroom.

In the same article written by Tipton (2017), WBT is considered one of the best practices because this method of teaching seeks to empower students as learners. In most classrooms nationwide and worldwide, teaching remains direct instruction by a teacher who is "more knowledgeable" transferring knowledge through lectures and worksheets all leading to a test. However, whole brain teaching attempts to break away from this norm and allows students to become the "more knowledgeable ones" in control of teaching, while also taking attention away from tests and focusing on daily activities. Although there is no universal definition of a best practice, many companies/organisations believe that it is a research-based technique that has proven to be effective and can be repeated. It is along with this premise that the study explored the effectiveness of the WBT as a means to enhance students' performance in Grade 11 General Chemistry I.

A Gantt chart was used to show how the study was conducted. A Gantt chart, commonly used in project management, is one of the most popular and useful ways of showing activities (tasks or events) displayed against time. On the left of the chart is a list

of the activities and along the top is a suitable time scale. Each activity is represented by a bar; the position and length of the bar reflect the start date, duration, and end date of the activity (<https://www.gantt.com/>). Table 1 draws the entire flow of how the research was conducted and led to the development of conclusions and recommendations by the researchers. The first column shows the activities conducted by the researchers. The second up to the fourth column shows the months and weeks that the activities were conducted.

The table shows that on the first week of month 1, pre-test was administered for both the control and experimental group. From the second week up to third week of month 2, students were taught using the traditional method for the control group and WBT for the experimental group. On the last week of month 2, a post-test was administered and the results were analyzed using the statistical treatment. After the analyses of the data, the effectiveness of the WBT style was determined and conclusions and recommendations were made by the researchers.

Table 1. Activities undertaken during the research study using a Gantt chart

Activities Undertaken	Month 1				Month 2				Month 3		
	1	2	3	4	1	2	3	4	1	2	3
1. Conduct of Pre-Test to Grade 11 STEM											
2. Stratified random selection of students for Control Group (to be taught using 4As) and Experimental Group (to be taught using WBT)											
1. Use of WBT for Grade 11 students using the following procedures.											
a. Preparation of the class by orienting the students on lessons/topics studied											
b. Usage of the WBT in Grade 11 Science Instruction											
c. Evaluation outcomes of instruction (Post-Test)											

1. Determine the mean scores by the post examination																				
2. Analyse the data using the statistical treatment																				
3. Determine the effectiveness of WBT by comparing the pre-test and post-test results																				
4. Compare the effectiveness of WBT to 4As based on respective pre-test and post-test results																				
5. Summarise the survey on the perception of the students on the WBT style																				

OBJECTIVES OF THE STUDY

This study generally aims to determine the effectiveness of Whole Brain Teaching (WBT) Style in enhancing the academic performance of Grade 11 Science Technology Engineering and Mathematics (STEM) students of Don Ramon E. Costales Memorial National High School, Villasis, Pangasinan, Philippines in General Chemistry I. Specifically, it sought to answer the following questions: (1) Is there any significant difference between the performance of students taught using WBT Style and students taught using K to 12 4As [Activity, Analysis, Abstraction, and Application] in terms of their mean scores in their posttest? (2) Is there any significant difference in the mean scores change of the students after the WBT style is done? (3) What are the perceptions of the Grade 11 students in using the WBT style in teaching the lessons in General Chemistry I?

3.0 MATERIALS AND METHODS

This study used both quantitative and qualitative methods of research. According to Bhat (2017), “quantitative research employs strategies of inquiry such as experimental and surveys, and collect data on predetermined instruments that yield statistical data.” Qualitative research, on the other hand, is defined as a [market research](#) method that focuses on obtaining data through open-ended and conversational communication. This method is not only about “what” people think but also “why” they think so (QuestionPro, 2018).

This study used stratified random sampling in determining the Pre-Test-Post-Test Control Group and Experimental Group. The control group was taught using the K to 12 4As (Analysis, Activity, Abstraction and Application), referred to as Class X while the experimental group, referred to as Class Y, was taught using the WBT style to look into the effectiveness of the latter in enhancing the performance of Grade 11 students of DRECMNHS in Science particularly in General Chemistry I.

3.1 Subjects of the Study

This study used Whole Brain Teaching (WBT) Style to enhance the academic performance of students of Grade 11 STEM in General Chemistry I in terms of their mean scores in the pre-test and post-test.

3.2 Statistical Treatment of Data

The activities undertaken by the researchers, the data collected and the statistical treatments used are shown as follows.

Table 2. Activities undertaken, data collected and statistical treatment used by the researchers.

Activities	Data to be Collected	Data Analysis/ Statistical Treatment
1. Use of WBT using the following procedure. a. Prepared the class by orienting the students on lesson/topic to be learned b. Used WBT to teach the lesson. c. After the WBT the teacher wraps up the activity d. Evaluate outcomes of instruction	Pre-test/post-test results for the Second Quarter	Paired Sample Test (T-test)
2. Establish the mastery learning by quarterly examinations.	Data on Quarter exams	Mean Scores Paired Sample Test (T-test)
3. Conduct a survey on the students for their perception of the WBT style.	Perception – using google form	Descriptive / Qualitative

To determine if there was a significant difference in the pre and post-test of the students and the degree of effectiveness of WBT, the result was tallied and was analysed at 0.05 level of significance.

RESULTS AND DISCUSSION

This study shows that the Whole Brain Teaching (WBT) Style is an effective instructional strategy that enhanced the academic performance of Grade 11 Science Technology Engineering and Mathematics (STEM) students of Don Ramon E. Costales Memorial National High School, Villasis, Pangasinan, Philippines in General Chemistry I.

As illustrated in Table 3, the control group, Class X, obtained a posttest mean score of 44.7200 while the experimental group, Class Y obtained a mean score of 51.6000. The mean score of the students taught using WBT style was higher compared to the mean score of the students taught using the K to 12 4As. Jensen (2009) said that there is a lot of evidencesuggesting there is a link between movement and learning, as well as movement and retention. Movement can be an excellent cognitive technique for (1) enhancing learner motivation and morale, (2) improving memory and retrieval, and (3) strengthening learning. This supports what happened in the academic performance of the students after administering the WBT style.

Table 3. Mean scores of control and experimental groups in their post-test or quarterly test.

n = 50

Class	Mean	N	Std. Deviation	Std. Error Mean
x	44.7200	25	11.75273	2.35055
y	51.6000	25	10.16530	2.03306

Table 4 shows a positive correlation of 0.408 and a level of significance at 0.043 which means that WBT style improves performance in terms of post-test or quarterly examinations. Table 5 also shows that WBT style in teaching improved the students'

performance in terms of the mean scores change in their post-test. The mean difference was -6.8800 which means that the post test scores of Class Y, who were taught using the WBT style are higher than the post test scores of Class X

Table 4. Effect of WBT style in the performance of students in their post-test.

Class	N	Correlation	Sig.
Pair 1 x & y	25	.408	.043**

** significant at 0.05 level * significant at 0.01 level

Table 5. Mean scores change in the post-test of the students after the WBT style was done.

	Mean Score	Mean Difference	t-value	Sig (2-tailed)
X	44.7200	-6.88000	-2.866	0.009
Y	51.6000			

** significant at 0.05 level * significant at 0.01 level

Results also shows that students' pre-test scores improved significantly for Class Y after WBT style was carried out. Table 6 draws the mean scores of the pretest and post-test; a mean difference of -2.384 which means that WBT style improved the scores of the students; a positive correlation value of 0.515; and finally,

a p-value of 0.000 which means that there was a significant difference in the mean scores change of the students after the WBT style was applied. This means that WBT style is an effective instructional strategy in improving or enhancing the academic performance of students in terms of pre-test and post-test scores.

	Mean Score	Mean Difference	r-value	Sig	t-value	Sig (2-tailed)
Pre	27.7600	-2.384	0.136	0.515	-10.173	0.000
Post	51.600					

Table 6. Mean scores change for the pre-test and post test scores of students taught using WBT (Class Y)

** significant at 0.05 level * significant at 0.01 level

After the conduct of the WBT style of teaching, the students were interviewed about their experiences on the teaching style. Most of the students enjoyed the WBT style of teaching. They also said that it was a fun method and it kept them alert in class. But some students also said that they were pressured sometimes because the WBT makes them think faster than usual. In an article written by Elmore (2017), she said that while this technique is ideal for kids who have experienced trauma, other students may find this method of learning to be overwhelming. If students have a timid, quiet, or sensory-processing-impaired pupil, this may not be the best technique for them. But generally, the students preferred the WBT style than the usual lecture-discussion type of teaching.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it may be claimed that the WBT style in teaching General Chemistry I is an effective instructional strategy to improve or enhance the academic performance of students in terms of their examinations. Also, WBT is an instructional strategy that is engaging and motivating since the students enjoyed this teaching style more than the K to 12 4As. It can also be concluded that learning can happen at the same time with fun and enjoyment and this is evident in the academic performance of the students before and after the implementation or application of the WBT style of teaching.

The researchers strongly recommend using the WBT style in teaching not only in General Chemistry I, but it can also be used in other subjects other than science. Also, it must be carefully planned as well, and it can be done even on a unit lesson. Varying the strategies per unit is also a suggestion to cater to the needs of the students. The researchers also suggest that teachers who will try to use this teaching style must learn to do it properly for it to become successful.

REFERENCES

Apps, J. W. (1978). Study Skills for those

Adults Returning to School; Mc Graw Hill Book Company.

Battle, J. Whole Brain Teaching: Learning the Way the Brain is Designed. (2010). Retrieved from http://www.advanced.org/source/whole-brain-teaching-learningway-brain-designed_

Bautista, A.G., et.al. (2002). Students Teachers Manual for Observation and Participation. Phil. Association for Teachers Education, Katha Publishing Co. Inc.

Benjamin Franklin Quotes. Retrieved from https://cutt.ly/oWaMCQJ_

Best, J. W. and Kahn, J. V. (1989) Research in Education. 6th Edition, New Jersey. Prentice Hall.

Bhat, A. (2017). What is a descriptive research? Retrieved from: <https://www.questionpro.com/blog/descriptive-research/>.

Biffle, C. Whole Brain Teaching. (2013). Retrieved from: <https://wholebrainteaching.com/>

Charles, I. & Chen, L. (2017). Whole Brain Teaching. Retrieved from <http://teachnowcohort52017.pbworks.com/w/page/140498535/Whole%20Brain%20Teaching>.

Clark, H. W. S. (2016). Effect of Whole Brain Teaching on Student Self Concept. Retrieved from http://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=3249&context=dissertations_Motivation_in_Commercial_Bank_of_Sri_Lanka_Plc,_In_Jaffna_District. Global Journals Inc. (USA).

Elmore, H. D. (2017). What is whole brain teaching? Retrieved from <https://www.teachhub.com/professional-development/2017/06/all-about-whole-brain-teaching-strategies/>

Jensen, E. (2009). *Teaching with poverty in mind: What being poor does to kids' brains and what schools can do about it*. Alexandria, VA: Association for

- Supervision and Curriculum Development.
- K to 12 Curriculum Guide Science. (2013). Retrieved from <http://odea.sdb.ph/ODEA/downloads/Kto12Science-CG.pdf>
- K-12 General information. Retrieved from <http://www.deped.gov.ph/k-to-12/faq>.
- Montebon, D. T. (2014). Science Program in the Philippines: Student Perception on its Implementation. Philippine Normal University. International Journal of Education and Research.
- Orleans, A. V. (2007). The Condition of Secondary School Physics Education in the Philippines: Recent Developments and Remaining Challenges for Substantive Improvements. Hiroshima University, Japan. Retrieved from: <https://files.eric.ed.gov/fulltext/EJ766603.pdf>.
- Ouellette, D. (2000). Learning Styles in Adult Education. Retrieved from Polaris.umuc.edu/~rouellet/learnstyle/learnstyle.htm
- Qualitative Research: Definition, Types, Methods and Examples. (2018, March 27). Retrieved from: <https://www.questionpro.com/blog/qualitative-research-methods/>
- Seiler, D. (2012). Age and Learning Style in the Adult Learner. Retrieved from <http://www.hraljournal.com/Page/15%20David%20Seiler.pdf>
- Tipton, A. (2017). Whole Brain Teaching. Retrieved from: <https://ashleytipton.weebly.com/whole-brain-teaching.html>.
- Travers, R.M.W. (1977). Essentials of Learning. 4th Edition. New York. McMillan Publishing Co., Inc.
- Vanhosen, W. (2015). The Effect of Whole Brain Teaching in the Academic Outcomes of African-American Elementary Male Students. Retrieved from <http://wholebrainteaching.com/research/>
- Wehrwei, E. A., et. al. (2007). Gender differences in learning style preferences among undergraduate physiology students. Retrieved from advan.physiology.org/cgi/content/full/31/2/153.
- What is a Gantt chart?. (2022). Retrieved from: <https://www.gantt.com/>.