

Influence of Brain Based Learning on Achievement of Students at Elementary Level

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ABSTRACT

This research was experimental in nature. Researcher intended to measure the nature and influence of Brain Based Learning on the achievements of students at elementary level. Researcher selected Grade 7th. Two groups were formed named as experiment and control group. For seven week intervention was given to experiment group while control group was taught by conventional methods in English subject. True experiment design (Pre-test, post-test) was used to measure the effects of Brain Based Learning on the achievements of students before and after intervention. Test was pilot tested before it was applied to the sample. Item index was drawn to check the validity of each item. Reliability was checked by Cronbach alpha that was measure as 0.821. Researcher went through relevant literature to get proper information about the concept of Brain Based Learning. Brain Based Learning (BBL) has been an emerging phenomenon throughout the world for some decades. Brain Based Learning held the view that learning should involve student's whole physic for better learning. Several methods and techniques were used to involve learner fully into the lesson. Brain Based Learning consists of twelve principles that base the modern learning styles. Results were analyzed by applying independent samples t test, paired samples T-test and ANCOVA. Overall results showed that experiment group students achieved better after getting intervention as compared to control group.

Key words: *Brain Based Learning; Conventional teaching method; Achievements*

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Introduction

Learning is basically the acquisition of knowledge through study or experience. Learning and process of learning is defined differently time to time. Brain Based learning is a teaching strategy that involves lesson planning, lecture designing and designing of school programs based on the results of such scientific researches that indicated ways of learning of brain. These ways include cognitive development in terms of their ways of learning when they are growing physically, emotionally, socially and intellectually. Brain Based Learning has emerged as an inclusive slant for instruction. This approach (BBL) provides a structured classroom based on biological principles that associates human brain functions to different levels of development. This practice aims to engage the whole body in teaching and learning process. It should be aim of teacher to utilize classroom scenario to engage all senses of human being.

Caine & Caine (1995) said that they outlined a theory about how learner should learn and how teacher should teach. They wrote that they conducted this experiment with their colleagues in a school Dry Creek. There they noted that teachers want their students to give better results and they were working hard for it but they really had no idea what should be the role of school and teaching methods in the improvement of students. Through old conventional methods they were constantly unable to draw desired conclusion. They however continued their experiment on a small group of students who at the start did not show any desirable change but in standardized tests they produce good results. They wrote that Dry Creek actually tell them the worth of their theory in everyday life. They wrote that traditional methods of teaching were teacher centered.

A few researchers implement brain based learning in science or other practical subject. Such as Rehman, Malik et.al (2012) practiced this in the subject of mathematics. Researcher intended to implement this theory in subject of English. Usually English is taken as an international language and mostly its teaching is based on conventional lecture method or rote memorization. By using conventional methods this subject has been transformed into a difficult subject instead of an interesting language or a way to cope with the international world. So the researcher wants to implement and draw conclusion. In contrast to traditional teaching there are

other theories like cooperative learning, thematic instruction and meaning centered curriculum. But all these also limited and fragmented. While Brain Based gives a complete picture. First point they produce their theory of importance is that they want a shift from memorizing to meaningful learning because brain cannot accept information that is not logical so it is called Patterning.

Working of brain is essential to understand here as Lucariello et.al (2016) wrote brain is basically complex system of neurons and interneurons that generate astronomical number of neural sets that gradually construct our experience. The brain of human being is composed of special cells named as “Neurons”. These neurons consist on different parts like, “brain fibers (dendrites)”. With the act of learning these dendrites grow and they connect mutually with one another at a contact point that is called “Synapses”. Gareau (2011) described two types of brain reactive and reflective brain. Reactive brain is the part of the brain that deals with emotions, fears and motivation of survival. While executive tasks are responsibility of reflective part of brain, which helps in problem solving, organizing, focusing, predicting or thinking etc. teaching strategies for both are given differently.

Degen (2014) Talked about structure of brain in medical science. He noted that the important neurological finding about how the human brain memorizes things is termed as declarative memory by Degan. He explained the four sequential steps of declarative memory. They include, encoding, storing, retrieving and forgetting. Different types of input are given that form an imaginary picture of knowledge and it get stored into memory of student sometimes after repetition. Retrieving is to recall the learned information when needed. Forgetting is also a part of memory. As Winters (2001) writes that latest MRI research has identified the possible location of cognitive development and learning activities that denies the previous concept of brain as computer and states that brain uses several strategies to absorb knowledge and information that we desired to get.

Degen (2014) Wrote that some research also showed that the brain cannot work properly in multitasks. It will work more appropriate manner only when it is performing one task and second thing is that it should not be interrupted. Connell (2009) wrote that our emotional influence and ability to learn are basic components of brain based learning. Our brains make constant connection between our intellect and emotions. Pickering & Jones (2007) also acclaim

that neuroscience and psychology should be included in primary teacher-training courses. Guisbond & Levy (2013) explain brain based learning as teaching methods that based on scientific research and modern methods of teaching. Brain based learning is not a new concept.

Spears & Wilson (2009) Wrote in their article that Brain Based Learning encompasses educational concepts that include mastery learning, multiple, cooperative, practical, experiential, or problem based learning. Goldberg (2002) named this style of learning as actor-centered adaptive decision making. Connell (2009) wrote that Brain Based Learning has such basis that are easily applicable to all regular educational institutes. As BBL has twofold emphasis. Firstly it encourages educators to transform their teaching methods and strategies. Secondly it emphasis on environmental change. Kane (2013), Dewey (2010), Brenda (2002) and Bonk & Graham (2012) also put emphasis on environment that supports to organize Brain Based classroom. There are related terms like Brain-Based Education and Brain-Based Teaching; these are directly related to Brain Based Learning.

Scientists are of the view that learning is affected deeply by certain circumstances like fatigue, environment, stress, diet etc. that is why Brain Based Learning involves all these aspects in its planning so that no environmental or physical factor can affect teaching learning process. Cave, Ludwar, & Williams (2005) wrote in a paper that in last decade more concern to Brain Based Learning is noted. A concept of change and improvement in every area of education desired new method of assessment, environment, memory, biology of learning, mental models and improved students' achievements. So, Brain Based Learning involves all aspects of teaching learning process and it aimed at providing beneficial and practical knowledge to students.

Caine & Caine (1995) Considered that modification of teacher's mental model would ultimately bring change in teacher's perception that will surely lead to the innovation in teaching strategies resulted in improvement of learning of students. So Caine (2009) believe that professional improvement and change in mental model of teacher will only be when teacher himself begins to think that he is responsible to improve himself professionally.

Principles of Brain Based Learning (BBL):

Psychologists like Caine and Caine (1990), described twelve principles of Brain Based Learning (BBL). These principles started from explaining Brain as parallel processor that

includes entire physiology. They claim that there are certain pursuits in human nature, one of them is “quest for meaning”, that is usually innate and this transpires through “patterning”. Brain processes parts and whole and emotions go side by side as Learning involves both “focused attention and peripheral perception”. Spatial and Rote memory turns learning into conscious and unconscious process. It develops student’s brains by giving challenging environment. Researchers are of the view that each brain is unique. Each student has a different type of brain. Or one can say that capabilities and intelligence of each individual is different.

Boss (2011) Wrote on his online blog Edutopia six tips for proper brain based learning. Firstly, he emphasizes on creating a healthy and safe environment for learning. Second tip is “encourages a growth mind-set”. It deals with asking students to describe their mind sets, their fears and feelings. Researcher used different teaching methods including deductive, inductive, Grammar Translation Method, Discussion, project, and cooperative learning methods. Ratminingsih and Ana (2012) discussed inductive and deductive as two important methods of teaching of English. They hold the opinion that deductive method is important to teach and memorize the learners rules of English tenses and grammar. While inductive approach is necessary for learners to implement those learned rules into their daily communication. This study might be helpful for teachers to improve teaching methods, for Curriculum Developers to design Brain Based Curriculum and for students to maintain their full attention in achieving routine task.

Objectives

Following are the objectives of the study:

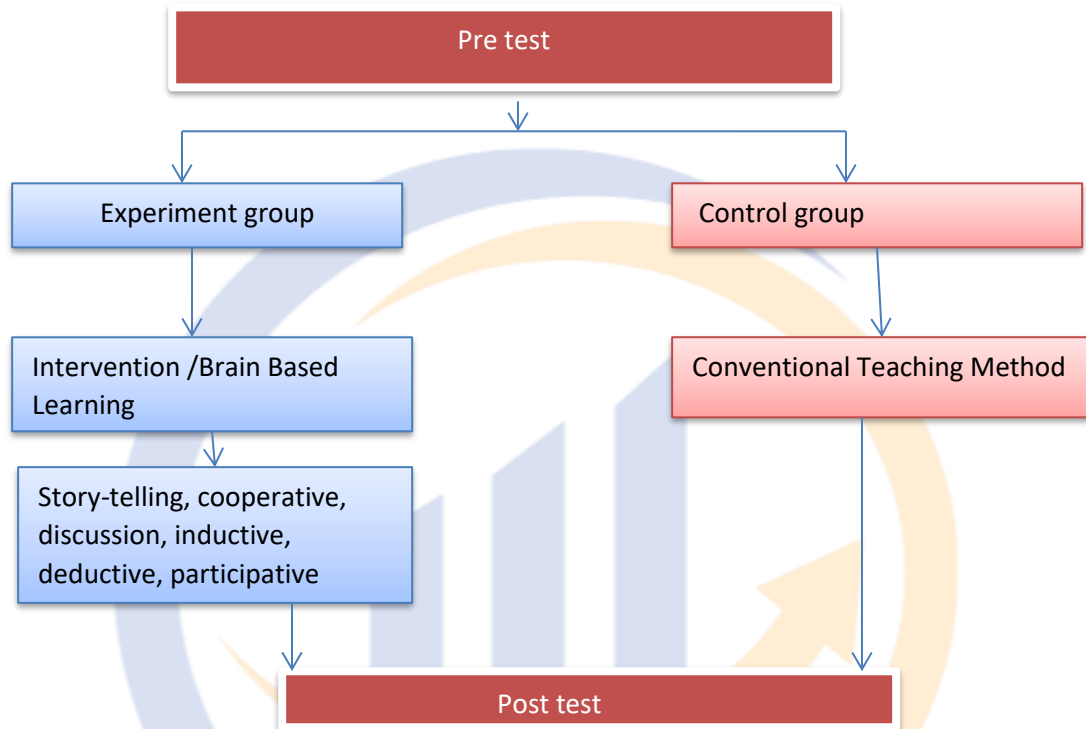
1. To explore the difference between Experiment and Control group before treatment.
2. To compare the difference between Experiment and Control group after treatment.
3. To examine the difference within group achievements of students of experiment group after treatment.

Research Question

1. Was the performance of Experiment and control group different before treatment?
2. What was difference between the achievements of Experiment and control group after treatment?
3. Was there any difference in the achievements of pre-test and post-test of experiment group?

Research design

This research was experiment in nature. Pre-test, post-test control group design was followed. Both groups consisted of 40 students.



Sample

A sample of 80 students from Government Yasmeeen girls' High School Lahore was selected. The school was selected randomly by making a draw of the names of schools in Lahore cantt. Then test was administered on the sample of 80 students. On the basis of pre-test results two groups were formulated according to systematic random sampling, each consisted of 40 students. Groups were formulated by adding 12 high achievers 16 average and 12 low achievers. Test results were arranged in descending order. Among 24 high achiever students 12 odd and 12 even numbers were separated. From middle 32 students 16 odd and 16 even numbers were separated. In the same way among 24 low achievers 12 odd

and 12 even numbers were separated. Randomly one group was selected as experiment group and other as control group.

Instrument

A Test was prepared as instrument according to blooms taxonomy. 45 items were prepared and pilot tested on the 60 students from population before administering the actual test on the sample.

Procedure

The study under reference was experiment in nature. The research procedure was based on Pre-Test, Post-Test design. A test comprising 45 items was developed under expert advice and based on table of specification. It was pilot tested on 60 students from population. Its reliability was checked on Cronbach alpha that was measured as .821 that indicated reliability of test as it was more than .7. Content validity was checked by the team of experts having qualification of M.A, M.Ed along with ten years' experience. A sample of 80 students was selected and divided into two groups. Pretest was conducted and results were saved for analysis. After seven weeks field work again same test was repeated and scores were analyzed.

Results

Table 1.1: Independent Samples t-test

	Control		Experiment		Independent samples t-test		
	Mean	SD	Mean	SD	T	df	P
Knowledge pre-test	47.50	20.51	47.88	16.44	-.09	78	.928
Knowledge post-test	56.94	21.27	67.78	17.98	-2.46	78	.016
Understanding Pre-test	57.61	29.19	65.59	22.59	-1.367	78	.175
Understanding post-test	63.94	19.79	73.00	15.39	-2.28	78	.025
Application Pre test	54.67	21.52	57.00	19.33	-.51	78	.611
Application Post test	61.83	23.48	73.50	19.30	-2.43	78	.018

Total Pre-test	55.17	19.50	56.48	14.54	-.34	72.13	.735
Total Post-test	58.72	19.34	70.99	14.88	-3.18	73.18	.002

Table 1.1 Shows the results of Independent-samples t-tests. The tests were performed to compare the between groups effects of the intervention on students' achievement in different domains on pretest and posttest. Results showed that there was no significant difference in achievement of pre-test of control group and experiment group. But the results of experiment group posttest were significantly higher than the results of control group.

Table 1.2 : Paired Samples t-test Control group

	Pre-test scores		Post-test scores		Paired samples t-test		
	Mean	SD	Mean	SD	T	Df	P
Knowledge	47.50	20.50	56.94	21.27	-4.190	39	<.001
Understanding	57.61	29.19	63.94	19.79	-1.240	39	.222
Application	54.67	21.52	61.83	23.48	-2.321	39	.026
Total	55.17	19.50	58.72	19.34	-1.979	39	.055

Table 1.2 depicts the results of Paired-samples t-tests that were conducted to compare the within group effect of the intervention on students' achievement of Knowledge, Understanding and Application and total of English subject grade VII. These paired samples t-tests were conducted on Control group data. There was statistical difference in achievement in pre-test and post-test. Post-test achievements were significantly higher than pre-test results.

Table1.3: Paired samples t-test Experiment group

	Pre-test scores		Post-test scores		Paired samples t-test		
	Mean	SD	Mean	SD	T	Df	P
Knowledge	47.88	16.44	67.77	17.98	-6.762	39	<.001
Understanding	65.59	22.59	73.00	15.39	-1.096	39	.043

Application	57.00	19.33	73.50	19.30	-6.258	39	<.001
Total	56.48	14.54	70.99	14.88	-7.688	39	<.001

Table 1.3 depicts the results of Paired-samples t-tests that were conducted to compare the within group effect of the intervention on students' achievement of Knowledge, Understanding and Application and total of English subject grade VII. These paired samples t-tests were conducted on Experiment group data. There was statistical difference in achievement in pre-test and post-test. Post-test achievements were significantly higher than pre-test results.

Table 1.4: Summary of ANCOVA: Comparison of Control and Experiment Groups on Post Test Scores of Knowledge after Adjusting Pre-Test Scores of Knowledge

Source	SS	df	MS	F	P
Knowledge Pre-test scores	11855	1	11855	49.638	<.001
Understanding pre-test scores	1440	1	1440	4.803	.031
Application Pre-test scores	14135	1	14135	49.680	<.001
Total pre-test scores	13820	1	13820	113.211	<.001

$R^2 = .436$ (Adjusted $R^2 = .421$)

Table 1.4 shows comparison of the effects of given treatment. One way between group analyses of covariance (ANCOVA) was conducted by adjusting the pre-test scores of Knowledge, understanding, application and total test scores of both groups (Control, Experiment) to the post-test scores of Knowledge. According to set criteria p value was found as $p < .05$. That indicated a significant difference between Experiment and Control groups.

Conclusions

Following conclusions were drawn from the research,

Question no 1: Was the performance of Experiment and control group different before treatment?

It was answered by results of Independent-samples t-tests. It was noted that there was no significant difference in pre-test achievements of control and experiment groups.

Question no 2: Was there significant difference between the achievements of Experiment and control group after treatment?

Independent samples t-tests depicted the post-test results of experiment group were significantly higher than the results of control group. ANCOVA value of total ($p < .001$), knowledge ($p < .001$), understanding ($p = .031$) and application ($p < .001$) also supported the results that performance of Experiment group was better after intervention as compared to control group.

Question no 3: Was there any difference in the achievements of pre-test and post-test of experiment group?

Paired-samples t-tests were conducted to compare the within group effects of the intervention on Experiment group. Results showed that Post-test scores were significantly higher than pre-test scores. One way between group analyses of covariance (ANCOVA) was used to adjust the pre-test scores of Experiment groups to the post-test scores of the same group. Results showed that there was significant difference in scores of Experiment group.

Discussion

The researcher found that Brain Based Learning theory worked to a greater extent on the students of experiment group. As Connel (2009) concluded in his article that in past twenty years Brain Based Learning has grown to a greater extent. Kane (2013) says that Brain-based theory of MacLean is an illustration of educational experimentation that follows the scientific field of study and education application. Malik (2012) drew same conclusion at the end of experiment that students of experiment group were performing better than students of control group.

During field work researcher noted that several factors were affecting the study. Classroom Environment was control to greater extent. As many other researchers find this factor quite affective in teaching learning process. Environmental factor was also reported by other researcher like Connell (2009) allows educatores to design learning environment according to needs of students and he can make challanging enviornment of classroom in order to intellectual development. Bonk & Graham (2012) say in this regard that the environment supports to organize the chemical balance of the brain, and can alter with rapid or ongoing environmental interruptions. Kovalik's theory ITI showed that Learning environment is also important. It is said that a proper and balanced atmosphere will increase the interest and chance of understanding in the students.

Result of post-test show significant difference between the Experiment and Control groups' achievements. After applying various test conclusions are drawn that pre-test and post-test results between both groups and within groups also differs. Post-test results are significantly higher than pre-test results of both groups. The study by Fuchs in 1990 also gave similar results as of Rosenzweig in 1968. Fuchs' study also showed that brain can be affected by experience. Some areas were affected positively more than other areas. Gozuyesil and Dikici (2014) wrote in article that is meta-analysis of 31 studies and 42 effects. The findings show that 32 out of 42 comparisons show positive results on this study. This revealed that there is medium type of effect on the achievement of students. Brain Based supports the idea of discovering many ways of learning and implement in the classroom. Effect size was different in terms of countries where studies were conducted. It is important to note that effect size in Turkey is larger than the studies conducted in USA.

Although Jensen (2003) criticized that Individual differences prove hindrances in achieving high standards to everyone. And they may affect results. But it is important to note that significance difference in the performance of both groups is found. After treatment experiment group was found better than control group.

Recommendation

- Teachers can implement Brain Based Learning strategies to improve various skills of learning English such as reading, writing, listening and speaking.
- School administration can implement Brain Based Learning for the improvements of quality education. Teachers training programs should be designed according to advanced Brain Based research.
- Curriculum developers may incorporate the results of this study in developing the content of class 7th, subject English.
- Replication of this study on larger sample and different subjects may be conducted.
- Comparative study of different Brain Based learning strategies may be conducted to determine the best methods for different subjects.
- There is need to implement the Brain Based Learning on different skills of individually.

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