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BRAIN COMPATIBLE LEARNING: AN EFFECTIVE TOOL FOR ENHANCED LEARNING IN CHEMISTRY

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ABSTRACT

Studies in the field of neurobiology have improved understanding of how the brain functions and how learning is formed. Brain Compatible Learning strategy has been called a combination of brain science and commonsense. Brain Compatible Learning strategy transact knowledge by activating the function of brain. Current research on neuro science report that there is a positive relationship between Brain Compatible Learning and pupils' academic achievement. The present study aimed to investigate interaction of instructional strategies on Achievement in Chemistry of standard IX students. This experimental study, which was designed as Pretest-Posttest Non-equivalent Group Design with sample consists of 80 pupils in IX grade. Two classes from two schools were determined as experimental and control groups respectively. During the research process, the experimental group was administered a Brain-Compatible learning strategy, while the control group was administered a Activity Oriented method of teaching. The data collected was subjected to statistical analysis, namely, Mean Difference Analysis, and One way Factorial ANCOVA. One of the important findings of the study is that the Brain Compatible Learning Strategy is more advantageous over Activity Oriented Method of Teaching in enhancing students' achievement in Chemistry.

KEY TERMS: *Brain Compatible Learning strategy, Activity Oriented Method of Teaching, Achievement in Chemistry.*

INTRODUCTION

Instructional Strategies have a great influence on educational process. The selection of strategies is in accordance with the objective of the curriculum. In many western countries innovative strategies of teaching are practiced, that encourages active participation of the learner. Indian educational system has been constantly subjected to several reforms especially in educational policies, curriculum, text book etc. but such reforms are very limited in transactional mode. But western countries are far ahead in researching and use. In such a situation, the existing system of education requires some improvement in teaching learning process. There are several instructional strategies that help the teacher to realize the educational objectives.

Studies (Posner & Raichle, 1994) in the field of neurobiology have improved understanding of how the brain functions and how learning is formed. Educators who work in collaboration with neurobiologists integrate knowledge of the functions of the brain and adapt them to learning principles (Wortock, 2002). Brain-based learning aims to enhance the learning potential and, in contrast to the traditional approaches and models, provides a

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teaching and learning framework for educators (Materna, 2000).

Brain Compatible Learning strategy transact knowledge by activating the function of brain (Caine & Caine,1991). Intensive studies conducted by Hart (1978), Wolfe & Partricia (2010), Radin & Jean (2009) and current research on neuro science report that there is a positive relationship between Brain Compatible Learning and pupils' academic achievement.

Brain-Compatible learning can be defined as an interdisciplinary answer to the question of "what is the most effective way of the brain's learning mechanism" (Jensen, 1998). Caine and Caine (2002) define brain-based learning as "recognition of the brain's codes for a meaningful learning and adjusting the teaching process in relation to those codes."

Need and Significance of the Study

The learning and teaching process in science courses should be based on exploration and inquiry. Since the brain inquires meaning and attempts to set associations in a natural way, exploration and inquiry based science teaching might function compatibly with the principles of brain-based learning approach (Mangan, 1998). Brain based learning aids teachers in facilitating the learning and teaching process. One way of relieving the process is to give learners more responsibilities for their own learning and encourage them to establish associations with the formerly learned subjects and new knowledge in order to form the learning. In order to establish this easiness in the learning and the teaching process, metaphors, thematic teaching, integrated teaching and open ended questions should be used in the learning environment.

The research base for Brain Compatible Learning (Slywester, 2010;) makes it clear that, it is very essential to know if this method of learning is just a fad, or whether it is a teaching method that has great promise in academic achievement of student across the nation.

The investigator could not locate study showing the interactive effect of Brain Compatible Learning Strategy and Activity Oriented Method of teaching in Chemistry in Kerala situation. Therefore, in our context the investigator decided to conduct an experiment on the same on high school students in Kerala.

Variables Selected for the Study

Independent variables of the study were Instructional Strategies (Brain Compatible Learning and Activity Oriented Method of Teaching). Dependent variable of the study was Achievement in Chemistry of Standard IX students. The variables controlled in the present study were; (a) Pre-experimental Status of the Students measured in terms of pre test and (b) Verbal Intelligence

OBJECTIVES

The following were the objectives of the study.

1. To study whether there exist any significant difference in the Mean Pre-test scores, Post-test scores and Gain scores of Achievement in Chemistry of the Experimental and Control groups for the total sample and subsamples based on Gender.
2. To study the main and interaction effects of Instructional Strategies on achievement in Chemistry of standard IX students.
3. To study the effectiveness of Brain Compatible Learning Strategy over Activity Oriented Method of teaching in terms of Achievement in Chemistry of standard IX students.

METHODOLOGY

The methodology of the present study is outline as follows.

Design of the Study.

With the view of realizing the major objectives of the study, the investigator formulated a Quasi-Experimental design in which the specific design used was the Pretest - Posttest Non-Equivalent Groups Design.

Sample for the Study.

The investigator selected 90 standard IX students from two intact classrooms. Among them 45 students were in control group and 45 were in experimental group. The Experimental group was taught through the Brain Compatible Learning strategy and the control group was taught through Activity Oriented Method of Teaching.

Tools Used for the Study.

For the present study, Lesson transcripts for Brain Compatible Learning strategy were developed by the investigator for treatment in the experimental group. Lesson transcripts for Activity Oriented Method of Teaching were developed by the investigator for treatment in the control group. Achievement Test in Chemistry was used as pre-test and post-test to measure the pre-experimental status of the students and the performance of the student after the treatment respectively. For the present study the control variable, Verbal Intelligence was measured using Verbal Group Test of Intelligence (VGTI) developed by Kumar, et al (1997).

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Statistical Techniques Used

Mean Difference Analysis was use in the study to know whether there exists any significant deference between the Experimental group and control group in case of Pre-test, Posttest and Gain scores, without controlling the effect of covariates. Analysis of Covariance (ANCOVA) was employed to remove statistically the effects of confounding variable or covariate, the initial status of the subjects measured in terms of a Pre-test and Verbal Intelligence. This statistical technique was employed to confirm the effectiveness of Brain Compatible Learning Strategy over the Activity Oriented Method of Teaching. Scheffe' Test of Post-hoc Comparison was used to compare the adjusted criterion means of the Experimental and Control groups to determine the advantageous groups in Covariance Analysis (Scheffe,1995) .

RESULTS AND DISCUSSION

Results of Mean Difference Analysis

The result of the Mean Difference Analysis conducted for the comparison of Mean Pretest, posttest and Gain scores between Experimental and Control group are presented in Table 1.

Table 1

Data and the Results of the t-test for the Mean Scores of Pretest between Experimental and Control Groups (Total sample)

Sample	Variable	Experimental Group			Control Group			t-Value	Level of significance
		M_1	SD_1	N_1	M_2	SD_2	N_2		
Total Sample	Pretest	6.5	2.116	40	6.8	2.20	40	0.62	NS
	Post Test	18.676	4.423	40	16.42	5.49	40	5.20	0.01
	Gain Score	9.5	4	40	9.87	4.99	40	3.14	0.01

NS- Not Significant

From the Table 1, the t-value obtained for pre-test for Total sample is not significant. The t-value obtained for achievement and Gain Score for Total sample is found significant at 0.01 level of significance. From the summarized result it can be said that Achievement in Chemistry and Gain Score differentiate the Experimental and control groups for the Total sample. In all the comparison the superiority of the Experimental Group over the control Group is evident.

Results of ANCOVA for Achievement

Summary of three ANCOVA undertaken to study the effectiveness of Brain Compatible Learning strategy over Activity oriented Method of Teaching a topic of Chemistry on Achievement in Chemistry of Standard IX pupils is presented in Table 2.

Table 2

Summary of One-way ANCOVA for Achievement in Chemistry - Pretest and Intelligence (Verbal) Covariates Separately and in combination

Sample	No. of Students	Dependent Variable	Source of Variation	Covariate	Sum of squares	df	Mean square Variance	F-Value
Total Sample	80	Achievement in Chemistry	Instructional Learning Strategies	Pre-test Scores	201.94	1	201.94	13.78**
				Intelligence (Verbal)	169.37	1	169.37	9.65**
				Pre-test and Intelligence (Verbal) in combination	188.84	1	188.84	12.80**

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Result of three ANCOVA shows that the ANCOVA conducted to study the effectiveness of Brain Compatible Learning Strategy over Activity oriented Method of Teaching in a Topic in Chemistry of Standard IX pupils yielded significant F-values, using pretest and Intelligence (Verbal) as covariates separately and the combination. Effectiveness of the Brain Compatible Learning Strategy is very clear when the effect of Pretest scores, Intelligence (Verbal) separately and in combination were successively removed.

The result of ANCOVA showed that standard IX students taught through Brain Compatible Learning Strategy and Activity oriented Method of teaching significantly differ in Achievement in Chemistry than the pupils taught through the Activity oriented Method of Teaching. As higher mean achievement scores were associated with the Experimental Group to which Instructional Learning Strategy was implemented, Instructional Learning Strategy is found advantages over the Activity oriented Method of Teaching in case of Achievement in Chemistry.

CONCLUSIONS AND INTERPRETATIONS

The main objective of the present investigation was to find out the Effect of Instructional Learning Strategies on Achievement in Chemistry of Standard IX pupils. Form the results of the analysis, the investigator arrived at the following conclusions.

1. Since all the t-values were not found significant in the comparison of Pretest scores, the result suggest that Experimental and Control Groups (Total and Sub samples) were similar in case of their performance in the pretest.
2. The t-value obtained for the comparison of Post-test for Total sample and Boys are found Significant. High Mean Achievement Scores associated with the experimental group suggests that they are advantageous over the Control group.
3. Significant difference in the Mean Gain score between the Experimental and Control Groups for Total sample is found to be Significant. But scores of boys and girls are not found Significant. It suggests that total sample of Experimental and Control Groups are similar in the case of their Gain score. Superiority of the Experimental group over the Control Group is noted, as revealed form their high Mean Gain Scores.
4. Summary of the result of Two-Way ANOVA showed significant main effect of Instructional Learning Strategies on Achievement in Chemistry (Total). The results suggest that variation in Achievement in Chemistry in dependent on the variation in the Instructional Learning Strategies.
5. Investigation of Group difference in Mean Achievement in Chemistry between Brain Compatible Learning (BCL) Strategy and Activity oriented Method of Teaching (AOMT) revealed that Brain Compatible Learning (BCL) Strategy has advantage in Achievement in Chemistry over Activity oriented Method of Teaching.
6. One-Way ANCOVA is employed to study the effectiveness of Brain Compatible Learning Strategy over Activity oriented Method of Teaching a topic in Chemistry of standard IX students using Pre-test and Intelligence (Verbal) as covariates separately and in Combination. From the result it can be concluded that the effectiveness Brain Compatible Learning Strategy over Activity oriented Method of Teaching significant while using Pretest and Intelligence (Verbal) as covariates separately and in Combination.

MAJOR FINDINGS OF THE STUDY

Results of the Covariance Analysis and the Scheffe' Test thereafter employed approved the fact that, even after removing the effects of the Covariates singly and in combination of the three at a time from the Dependent Variable the Experimental and Control groups revealed significant difference in the mean Achievement scores. In all the comparisons, Experimental group in which Brain Compatible Learning Strategy applied, seen to excel the Control group, where Activity Oriented Method of Teaching was used. Higher mean Achievement scores were associated with the Experimental group. That means, pupils taught through Brain Compatible Learning are at an advantage over pupils taught through Activity Oriented Method of Teaching.

Educational Implications Derived

Regarding the findings of this study, the Brain-Compatible learning approach appears to be more effective than Activity Oriented Method teaching procedures in Chemistry class in terms of improving students' academic achievement. This finding, which suggests that the Brain-Compatible learning approach is more effective than Activity Oriented Method teaching procedures, shows similarities with the studies of Salmiza,2012; Cengelci (2005) and Wortock (2002). Cengelci (2005) for instance, found out that the Brain-Compatible learning approach improved student achievement in social subjects.

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The result also shows that the irrespective of sex, Brain Compatible Learning Strategy has significant advantage over the Activity oriented Method of Teaching in Chemistry of Standard IX pupils. On the basis of finding, it can be said that Brain Compatible Learning Strategy may equally applicable in mixed sex schools and single sex schools. It is also implied that students of different ability level can be brought to optimum level, if Brain Compatible Learning Strategy is utilized in an effective way.

Students in the Brain Compatible Learning group showed better performance in learning and thinking and also showed better performance in evaluative level of learning than that of students in traditional learning situation. Students in Brain Compatible Learning group have significant superiority in Learning than existing learning method. It creates meaningful interaction among teachers and students in the classroom environment.

In a Brain Compatible Learning classroom, each individual was allowed to construct learning based on his or her past/current knowledge. That was why both the high and low achievers in the experimental group were able to progress at their own space and at the same time contribute to their peers learning.

The teachers of science subject in secondary schools can take advantage of implementing the brain-based learning approach in their teaching procedures on account of enriching their students' academic success and retention of the previously learned subjects. The materials, which were developed within the framework of the present study for the purposes of in-class practice procedures of the brain-based learning approach, can be adapted or modified by the teachers of science courses in secondary schools.

An in-service training program on the implementation of the brain-based learning approach in the science courses in primary schools can be offered to teachers. In collaboration with the teachers, some additional materials which are based on the brain based learning principles can be modified for the science courses in the 9th and 10th grades of primary schools. The syllabus of science teaching courses in primary school teacher training programs of educational faculties can be reshaped based on the principles of the brain-based learning approach.

REFERENCES

1. *Caine, R. N. & Caine, G. (2002). The brain, education, and the competitive edge. London: The Scarecrow Press, Inc., 2001.*
2. *Hart, L. (1978). Human Brain and Human Learning. Newyork: Mc Graw-Hill Company.*
3. *Jensen, E. (1998). Teaching with the Brain in Mind. Alexandria, VA: Association for Supervision and Curriculum Development.*
4. *Mangan, M. A. (1998). Brain compatible science. Arlington Heights: Skylight Professional Development.*
5. *Sylwester, R. (1995). A Celebration of Neurons: An Educator's Guide to the Human Brain. Alexandria, VA: ASCD.*
6. *Wolf, P.(2010) "Brain Matters: Translation Research in to Classroom Practice" . Second Edition. USA; ASCD*
7. *Wortock, J. M. M. (2002). Brain-based learning principles applied to the teaching of basic cardiac code to associate degree nursing students using the human patient simulator. Retrieved March 23, 2005, from http://proquest.umi.com/pqdweb?did=765069251&sid=7&Fmt=2&clientId=41947&RQT=309&VName=PQD.*