APPLICATION OF BRAIN BASED LEARNING IN TEACHING CHEMISTRY AT SECONDARY LEVEL.

UGC

MINOR RESEARCH PROJECT REPORT

Submitted By

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1. INTRODUCTION

People often say that everyone can learn. Yet the reality is that everyone does learn. Every person is born with a brain that functions as an immensely powerful processor. Traditional schooling, however, often inhibits learning by discouraging, ignoring, or punishing the brain’s natural learning processes. Since students’ mastery of the school curriculum happens primarily in the brain, it stands to reason that educators should be experts on the workings of that amazing organ. As with most major shifts in our conceptions, recent advances in our understanding of the brain have arisen from the convergence of findings from different fields of research — in this case, neuroscience and psychology. The brain based learning theory is based on the structure and function of the brain. As long as the brain is not prohibited from fulfilling its normal processes, learning will occur.

Only in recent years, since the development of new imaging techniques in medicine, have we had a substantial basis for learning theory. Brain research-based learning theory gives support to problem-based learning, alternative assessment, and education reforms. Our understanding of the brain gives positive hope for all students, substantiates broad as well as specific aims, and gives reasons to forge connections between and among prior and new learning’s. Much of what goes on in schools and, especially, in state mandated testing, not only fails
to be brain-compatible, but is actually brain antagonistic. The brain functions best with adequate time, the absence of threat, immediate feedback, dynamic interaction, with global contexts as well as delineation of parts, and in a state of relaxed alertness.

Brain-based Learning is the newest in educational theories. It encompasses past theories, such as multiple intelligences, metacognitive reflection and cooperative learning. Scientists will bridge brain physiology and how one learns more as scientific developments occur. As educators, parents and students understand the learning process, more students will succeed.

Brain-Based learning suggests that teachers must immerse learners in complex, interactive experiences that are both rich and real. Educators must take advantage of the brain’s ability to parallel process. Students must have a personally meaningful challenge. Such challenges stimulate a student’s mind to the desired state of alertness. In order for a student to gain insight about a problem, there must be intensive analysis of the different ways to approach it, and about learning in general. This is what’s known as the “active processing of experience.

Brain-Based learning is a comprehensive approach to instruction based on how current research in neuroscience suggests our brain learns naturally. This theory is based on what we currently know about the actual structure and function of the human brain at varying stages of development. This type of
education provides a biologically driven framework for teaching and learning, and helps explain recurring learning behaviors. It is a meta-concept that includes an eclectic mix of techniques. Currently, these techniques stress allowing teachers to connect learning to students’ real life experiences.

2. NEED AND SIGNIFICANCE OF STUDY

Brain Based learning theory is based on the concept that learning occurs in both conscious and unconscious processes. So teacher must utilize all the sensory experiences of the students incorporating the principles of brain based learning so that students can learn in an active environment.

The study may help working teachers of Chemistry at secondary level to organize such instructional strategies which may activate the in-built faculties of brain. For the purpose, teachers may present meaningful content, assure students of having say in the classroom, generate enriched classroom environment etc in light of the study. They may avail the findings of the study to enhance the levels of achievement of the learners. The teachers may improve concentration, interest, confidence and conceptual understanding of the students in light of the study. The teacher may be able to form homogeneous subgroups of the students and then assign suitable tasks to the students accordingly. The study may help chemistry teachers to compare between the instructional strategies of both the teaching methods and enable them to differentiate between brain friendly and brain-
unfriendly teaching learning activities. The teachers may, then, understand the conditions which are favorable or unfavorable for the teaching learning process. The curriculum of Chemistry at secondary level may be revised by the concerning authorities in light of the findings of the study which suggest elaboration of concepts according to the requirements of thinking brain. The Chemistry curriculum authorities may add such content which may enable learners to process meaningful content smoothly.

3. STATEMENT OF THE PROBLEM

An experimental research was designed to observe the effectiveness between BBL and conventional teaching methods. The effectiveness of the both teaching methods was compared through statistical tests on the academic achievement of the selected students. Hence the present study is entitled as “APPLICATION OF BRAIN BASED LEARNING IN TEACHING CHEMISTRY AT SECONDARY LEVEL”.

4. OBJECTIVES OF THE STUDY

The objectives of this study were to measure,

1. The effectiveness of BBL (brain based learning) teaching method versus conventional teaching method of the learners belonging to experimental and control groups respectively.

2. The effectiveness of BBL (brain based learning) teaching method versus conventional teaching method of the high achievers belonging to experimental and
control groups respectively.

3. The effectiveness of BBL (brain based learning) teaching method versus conventional teaching method of the average achievers belonging to experimental and control groups respectively.

4. The effectiveness of BBL (brain based learning) teaching method versus conventional teaching method of the low achievers belonging to experimental and control groups respectively.

5. HYPOTHESES OF THE STUDY

1. There is no significant difference between the performance of the students at secondary level in Kerala schools taught through BBL and conventional teaching methods.

2. There is no significant difference between the performances of the high achievers (HAs) taught through BBL and conventional teaching methods.

3. There is no significant difference between the performances of the Average achievers (AAs) taught through BBL and conventional teaching methods.

4. There is no significant difference between the performance of the Low achievers (LAs) of urban school taught through BBL and conventional teaching methods.

6. PROCEDURE OF THE STUDY

The study was conducted to compare the effectiveness of BBL teaching method with the conventional teaching method in teaching chemistry at secondary
level. The conventional method stands for usual classroom transaction procedure prevailing in our classroom. The researcher selected one complete unit of “Nature of Molecules” from the 9th standard Chemistry text book in Kerala syllabus.

6.1 Population

All the 9th class students studying Chemistry in Secondary Schools of Kerala were included in the population of the study.

6.2 Sample

The experiments of the study were conducted at N.S.S.B.H.S Perunnai, Changanacherry, Kottayam district. All the students of 9th class belonging to the selected school were separately placed on the normal distribution of their respective 8th class annual examination scores (AES). Then 60 students were chosen as sample of the study from the students falling under M ± 2s of the normal distribution of AES in the school. Later on, the sample of 60 students each was equally divided into high achievers, average achievers and low achievers through systematic random sampling.

6.3 Research Tool

An academic achievement test was constructed by the researcher. The items of the research tool were based on five innate faculties of the human brain i.e. parallel processing; innate search of meaning; pattern formation; perception through creation of parts and wholes; and uniqueness. The research tool of the
study was observed as valid through table of specification, consultation with the working teachers of Chemistry and experts’ opinions. The reliability of the research tool was observed through split-half method. The research tool was administered prior to start as well as at the immediate end of the experiment as pre-test and post-test respectively to all the students included in the sample of the study.

6.4 Data Collection and Analysis

Once the experimental and control groups were defined both groups were administered an achievement pre-test on the subject of Chemistry. The experiment process took 7 class hours, five class hours per week, between June 24- July 15, 2013. Throughout the experiment process, the experimental group practiced the brain-based learning approach, whereas the control group practiced the traditional teaching approach. At the end of the experiment process, both groups were administered an achievement post-test on the subject of Chemistry.

Data of the study comprising pre-test, post-test and 8th class AES (annual examination score, 2012). The scores were collected for high achievers, average achievers and low achievers. A 2×3 factorial design was followed in the study. The statistical tests of Pearson’s Correlation r and independent sample t test were applied through SPSS 12.
7. FINDINGS OF THE STUDY

Following findings were obtained from the analyses of the data of the study.

1. The mean (M) and standard deviation (SD) of pre-test scores for 30 students of experimental group were 13.90 and 3.88 respectively whereas M and SD of AES for the stated group were 354.07 and 89.97 respectively. A significant correlation exists between AES and pre-test scores of the students of the stated group, $r (30) = .88$, **$p < .005$. 

2. The mean (M) and standard deviation (SD) of pre-test scores for 30 students of control group were 14.77 and 3.86 respectively whereas M and SD of AES for the same group were 357.33 and 87.59 respectively. A significant correlation exists between AES and pre-test scores of the students of the stated group, $r (30) = .86$, **$p < .005$. 

3. There is no significant difference between the mean pretest score of students belonging to the experimental group ($M = 13.90$, $SD = 3.88$) and the mean pretest score of students belonging to the control group ($M = 14.77$, $SD = 3.86$) in urban school at alpha level of 0.05, $t = .87$, $p > .05$.

4. There exists significant difference between the mean posttest score of students belonging to the experimental group ($M = 40.23$, $SD = 3.27$) and the mean pretest score of students belonging to the control group ($M = 32.43$, $SD = 3.06$) in urban
school at alpha level of 0.05, t = 9.547, p > .05.

5. There exists significant difference between the mean posttest score of HAs belonging to the experimental group ($M = 49.44, SD = 3.26$) and the mean pretest score of HAs belonging to the control group ($M = 36.24, SD = 3.09$) with 0.05 alpha level, $t = 9.547, p > .05$.

6. There exists significant difference between the mean posttest score of AAs belonging to the experimental group ($M = 41.05, SD = 3.29$) and the mean pretest score of AAs belonging to the control group ($M = 30.64, SD = 3.06$) with 0.05 alpha level, $t = 7.38, p > .05$.

7. There exists significant difference between the mean posttest score of LAs belonging to the experimental group ($M = 34.05, SD = 3.27$) and the mean pretest score of LAs belonging to the control group ($M = 16.4, SD = 3.03$) with 0.05 alpha level, $t = 10.14, p > .05$.

8. CONCLUSIONS OF THE STUDY

Following conclusions have been drawn on the basis of findings of the study:

1. BBL teaching method is more effective than conventional teaching method to teach Chemistry at secondary level due to utilization of different faculties of human brain like parallel processing, innate search of meaning, perception through simultaneous creation of parts and wholes etc.

2. The achievement level of high achievers in the experimental group is
significantly more than that of high achievers belonging to control group. This effect was due to interaction of the concerning learners with meaningful content, peer tutoring, group discussions etc.

3. The performance of average achievers taught through BBL teaching method was better than those taught through conventional teaching method. This difference in performance was a result of working in small groups, individual assignments considering uniqueness of each brain, exploration of ideas through real-life problems, physical activities, relating previous knowledge to the fresh concepts in Chemistry etc.

4. Low achievers, taught through BBL teaching method, performed well as compared to the low achievers taught through conventional teaching method because the better performers were provided a low-threatening and high-challenging environment. Further the difference in the post test scores of experimental and control group is highest for LA category. So it can be concluded that brain based learning is most effective for LA category.

9. IMPLICATIONS OF THE STUDY

In light of the study, following recommendations are given.

1. How the brain works has a significant impact on what kinds of learning activities are most effective. Educators need to help students have appropriate experiences and capitalize on those experiences. As Renate Caine illustrates on p.
In her book *Making Connections*, three interactive elements are essential to this process:

- Teachers must immerse learners in complex, interactive experiences that are both rich and real. One excellent example is immersing students in a foreign culture to teach them a second language. Educators must take advantage of the brain’s ability to parallel process.

- Students must have a personally meaningful challenge. Such challenges stimulate a student’s mind to the desired state of alertness.

- In order for a student to gain insight about a problem, there must be intensive analysis of the different ways to approach it, and about learning in general. This is what’s known as the “active processing of experience.”

2. Feedback is best when it comes from reality, rather than from an authority figure. People learn best when solving realistic problems.

3. Because every brain is different, educators should allow learners to customize their own environments.

4. Designers of educational tools must be artistic in their creation of brain-friendly environments. Instructors need to realize that the best way to learn is not through lecture, but by participation in realistic environments that let learners try new things safely.
5. The teachers of science courses 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.