ENHANCING SELF-REGULATION SKILL AND LEARNING ACHIEVEMENT IN SCIENCE THROUGH BRAIN BASED LEARNING (BBL) STRATEGIES

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ABSTRACT

This study was executed as an experimental method and a pretest-posttest control group design. The total population was stratified and the sample size consisted of 96 (+ 2 Science) first-year students, who were selected randomly and were placed in two groups of control and experiment (each group, 48 students). The researcher taught the experimental group through lessons designed based on brain-based learning principles for 12 weeks. The achievement test was used for collecting the data. The collected data were analyzed by using the statistical technique i.e. analysis of covariance (ANCOVA) test. The results of the ANCOVA analysis test indicated that brain-based learning affects self-regulation & learning achievement in science. According to different researches, Brain-based Learning can be used as an intervention therapy for enhancing learning achievement in science of higher secondary students. This study also highlights the implications of different headings.

Keywords: *Brain-Based Learning, self-regulation Skills, Learning Achievement, Learning Style*

Introduction

Constructivist theory is the foundation of the present study. According to Jensen, 2008b, Gardner's theory of multiple intelligences is the stepping stone of brain-based learning whereas behaviourists approach of Skinner and Pavlov are the bases of teacher-centred instruction i.e. instruction for the control group. The constructivist theoretical perspective of education is the foundation for brain-based instruction (Bush, 2006). Brain-based instruction uses orchestrated immersion as a central component of student learning (Jensen, 2008b). Orchestrated immersion is using student knowledge as it applies to real-life situations (Jensen, 2008b). Brain-based instruction allows the use of multiple intelligences to work seamlessly with orchestrated immersion and active processing. Brain-based instruction stems from the research of Gardner's multiple intelligence theory, as Gardner used brain-based evidence for his theory of multiple intelligences (Jensen, 2008b). Brain-Based Learning (BBL) theory encompasses the functional and structural aspects of the human brain. Learning will occur till the human brain is not inhibited from the normal information process.

Brain-based instruction goes beyond the multiple intelligence theory; brain-based instruction includes the physical environment and reactions to learning to aid in increasing learning (Jensen, 2008b). Brain-based instruction has a focus on orchestrated immersion as one of three components, so students actively engage in learning (Wilmes, Harrington, Kohler-Evans, & Sumpter, 2008). Apart from orchestrated immersion, the two other components of brain-based instruction are relaxed alertness and active processing. As learning is a natural process it will occur with instinct but concerning different intensity called individual differences. Now the question may arise that if learning is a natural phenomenon then why learning is not at all same for all? Why individual differences exist in learning? The answer is that new learning must compatible with brain processes. BBL includes different activities which can engage both rights and left hemispheres of the brain, which leads to meaningful learning experiences as well as permanent neural connections.

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The current study uses this content specific theory as the theory relates to the constructivist theory and brain-based instruction. Currently, many teachers continue to use teacher-centred instruction even though the evidence is available to suggest a constructivist approach is more effective (Beauchman, 2005).

Significance of the Study

The previous research studies of (Kingir, Sevgi et.al, 2013; McClelland, Megan M.; Cameron, Claire E. 2011; Bakracevic Vukman, Karin; Licardo, Marta, 2010; Jakubowski, Terrance G. & Dembo, Myron H, 2002) who claimed that the relationships between the social-cognitive factors and academic achievement were mediated by self-regulation and science achievement. Though the works were done related to self –regulation problems of adolescent, none of the researches were related to applications of brain-based learning for enhancing achievement and self-regulation. Hence, the researcher decided to study the effect of brain-based learning strategies for elevating the self-regulation problems of adolescents. Furthermore, there has not been a study published on how brain-based instructional strategies specifically affect achievement in secondary school science in India.

Objectives of the study

1. To compare mean scores of self-regulation skill of brain-based learning(BBL) group and conventional method group by taking pre- self-regulation skill as a covariate.
2. To compare mean scores of achievement in Science of brain-based learning group and conventional method group by taking pre- achievement in Science as a covariate.
3. To study the effect of treatment, gender and their interaction on self-regulation skill by taking pre- self-regulation skill as a covariate.
4. To study the effect of treatment, gender and their interaction on achievement in Science by taking pre- achievement in Science as a covariate.

Hypotheses of the Study

Basing on objectives, the following null hypotheses have been formulated:

1. There is no significant difference in mean scores of self-regulation skill of Brain-Based Learning (BBL) group and conventional method group by taking pre- self-regulation skill as a covariate.
2. There is no significant difference in mean scores of achievement in Science of BBL group and conventional method group by taking pre- achievement in Science as a covariate.
3. There is no significant effect of treatment in terms of gender and their interaction on self-regulation skill by taking pre- self-regulation skill as a covariate.
4. There is no significant effect of treatment in terms of gender and their interaction on achievement in Science by taking pre- achievement in Science as a covariate.

Methodology of the study

Keeping the requirement of the study, pre-test post-test control group design was adopted. There were two sections (A & B) having 128 students in each section. The researcher had randomly selected section B for the study by employing a lottery method. After verification of the attendance, it was found that 96 students of section B had been attending the classes regularly. Finally, the researcher included all 96 students of Section-B in the study after getting their consent for participation in the experiment. The researcher taught the experimental group through lessons designed based on BBL principles for 12 weeks. After the intervention was over, experimental and control groups were exposed to post-test ,to determine the impact of BBL strategies as an instructional tool on self-regulation skill as well as learning achievement in Science of the students. The data collected from both the experimental and control groups in the pretest and posttest were analyzed by using t-test, two way ANCOVA.

Analysis and interpretation

Effect of BBL on Self-regulation Skills of Students: The adjusted F-value for treatment is 10.57, and its significance value with df =(1, 93) is 0.002. This value is lesser than 0.01 which is significant at 0.01 level of significance. It indicates that the adjusted mean score of self-regulation of student taught through BBL and conventional method differ significantly when pre- self-

regulation was taken as covariate. The BBL strategy was found to be significantly superior to the traditional method in enhancing self-regulation skill. The effectiveness of BBL on self-regulation was found to be effective as well as superior to traditional method when groups were formed randomly. This finding is supported by research findings that, the BBL affects self-regulated learning of Sadrabad, Ghavam and Radmanesh (2015); Lipsett (2011). Hence, it can be concluded that BBL strategies enhance self-regulation skills.

Effect of Brain-Based Learning on Learning Achievement of Student in Science: The adjusted F-value for the treatment group is 40.598, and its significance value with df = (1.93) is 0.000. This value is lesser than 0.01 which is significant at 0.01 level of significance. It indicates that the adjusted mean score of learning achievement of students in Science taught through BBL and conventional method differ significantly when pre- learning achievement score was taken as covariate. The BBL was found to be significantly superior to the traditional method in enhancing learning achievement in Science when pre- achievement score of Science was taken as covariate. Findings of the present study is in accordance with the earlier research studies conducted by Mojavezi and Tamiz (2012); Gozuyesil and Dikici (2014); Akyurek, Erkan; Afacan, Ozlem (2013); Duman (2010).

Effect of Treatment, Gender and their Interaction on Self-Regulation Skill: The third objective of the study was to study the effect of treatment in terms of gender and their interaction on self-regulation skills by taking pre-self-regulation skill as a covariate. It was found that the self-regulation skill of students was found to be dependent on their gender.

Table-1
Summary of One – Way ANCOVA of Self-Regulation Scores by Taking Pre-Self-Regulation as Covariate

Source of variation	df	SS y.x	MSS y.x	F y.x	Exact significance	Significance Level
Treatment	1	52.613	1076.186	11.000	.001**	< 0.01
Error	91	8902.652	97.831			
Total	96	895699.000				

**Significant at 0.01 level

Both male and female students were benefited from the Brain-Based Learning in enhancing self-regulation skill in comparison to conventional method when groups were matched statistically i.e. the adjusted F-value for treatment is 11.000, whose significance value with df = (1, 91) is 0.001. This value is lesser than 0.01 which is significant at 0.01 level of significance. It indicates that the adjusted mean score of self-regulation of male and female students differ significantly. Weis et al. (2013) reported that a significant sex difference favouring girls in behavioural self-regulation.

It may be because of the hormonal structure difference between male and female. Neuropsychology suggests that the difference may be due to the difference in the maturity of boys and girls. From the social and societal viewpoint, it may be because the girls, more often, are in the company of adults which stimulates the self-regulation to a greater extent.

This finding indicates that gender may be kept in mind while developing the BBL package to enhance self-regulation skill. The BBL package may not be the same for both male and female to content, sequence, examples, etc.

Effect of Treatment, Gender and their Interaction on Learning Achievement in Science: The fourth objective of the study was to study the effect of treatment in terms of gender and their interaction on learning achievement in Science by taking pre-learning achievement in Science as a covariate.

Table -2
Summary of One – Way ANCOVA of Achievement Scores in Science by Taking Pre- Achievement as Covariate

Source of variation	df	SS y.x	MSS y.x	F y.x	Exact significance	Significance Level
Treatment	1	30.300	1271.24	40.86	.000**	< 0.01
Error	91	2831.117	31.111			
Total	96	84989.000				

**Significant at 0.01 level

It was found that the learning achievement of students in Science was found to be dependent on their gender. Both

male and female students of the experimental group were benefited from the BBL in comparison to conventional method when groups were matched statistically i.e. the adjusted F-value for treatment is 40.86, whose significance value with df = (1, 91) is 0.00. This value is lesser than 0.01 which was significant at 0.01level of significance. It indicates that the adjusted mean score of learning achievement in Science of male and female students differ significantly.

As per global educational statistics, there is a clear gender gap in academic achievement between female and male with girls are ahead of boys in terms of subject grades Clark, Lee, Goodman and Yacco, (2008). From a theoretical point of view, this difference may be due to factors like personal/cognitive factors, their behavioural factors and environmental factors (Bandura, 1986) that influence them. Further, this difference of achievement i.e. female students appeared to be significantly higher in learning achievement may be due to greater parental control, longer attention span, emotional maturity & greater focus of female students.

This finding indicates that gender may be kept in mind while developing the BBL package on learning achievement in Science. The BBL package may not the same for both male and female students concerning content, sequence, examples, etc. There was no gender bias in developing the BBL package for this study.

Implications

The present study revealed that the BBL strategies had enhanced the learning achievement of students in Science as well as self-regulation skills irrespective of their gender. Thus, findings of the study would help the learners not only to regulate their self but also they can utilize maximum faculty of the brain for conceptual understanding as well as constructive thinking to generate linkage for assimilation and enhance the capacity of accommodation for a new concept. Thus BBL on Science can be very useful for the learner in the vital stage of adolescence. Secondly, teacher education must be planned with the BBL curriculum. This gives scope to pre and in-service teachers to apply the understanding of BBL in real classroom situations. The teachers who are in the field of Science teaching may utilize BBL package to enhance self-regulation among the teenage group, as a result, the understanding and planned to learn can be reflected on their achievement. Thirdly, the Head of the school must provide flexibility to the teacher to apply BBL strategies. The principal can also organize the workshop on the use of BBL so that the working teacher can get new ideas and way in using BBL strategies.

Conclusion

Conventional teacher cantered classroom instruction has been the norms for the instructional method as far as the classroom is concerned. This norm has been changing to more learner cantered method; BBL strategies are one such method currently used as an intervention for the experimental group. By examining the effect of BBL on learners' achievement as compared with a conventional method on learners' achievement, it is possible to establish the impact of BBL on instructional leadership. Evaluating the benefits of using BBL strategies might lead to further changes in the teacher education programme to veteran teachers' professional development.

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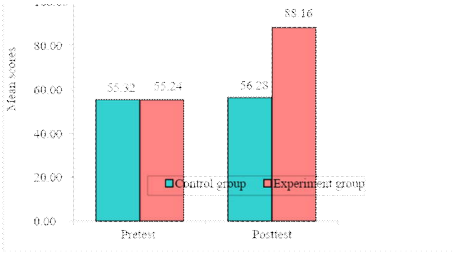
Figure No. 1: Comparison of Control and experiment groups with respect to pretest, posttest and gain scrores of acheievement in Mathematics of 10th standard students of secondary schools



Educational Implications

CAM provides a chance to analyze the students thinking process and to help them develop more effective strategies for thinking and concept attainment. In this study, CAM has been found to facilitate achievement of learners in Mathematics, apart from that this study facilitates to reduce the Stress (Anxiety) among the secondary school students. This has an important implication for teaching Mathematics to the school children. Therefore, the Mathematics teachers may be trained in using CAM for the teaching of Mathematics.

Keeping in view the limitations of the present study, and the constraints under which it was conducted, the findings do not warrant wide generalization. It is, therefore, suggested that replication of this study on a larger sample of different age-groups, grade levels, subject areas, sex, socio-economic status and intelligence level, be made to arrive at more reliable and precise results.

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