RESEARCH REVIEW JOURNALS
Volume-04
Issue-06
June-2019

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com[UGC Listed Journal]

Effect of Brain Based Instructional Strategies on Achievement in Science of Male and Female Secondary School Students of Chandigarh

*1Kapil Kanan & 2Sharma Latika

1Research Scholar, Department of Education, Panjab University, Chandigarh (India)
2Professor, Department of Education, Panjab University, Chandigarh (India)

ARTICLE DETAILS

Article History
Published Online: 12June 2019

Keywords
Brain Based Learning, Brain Based Instructional Strategies, Achievement in Science, Gender..

***Corresponding Author**
Email:kanan.kapil[at]gmail.com

ABSTRACT

Brain Based Learning is the result of inter-relationship among Neuroscience, Psychology and Pedagogy, in which discoveries from the brain sciences are taken up and applied to teaching methodologies. Brain Based Instructional Strategies are deeply rooted in three fundamental elements of Brain Based Learning- Relaxed alertness, Orchestrated immersion and Active processing. The understanding of Brain Based Learning and incorporation of Brain Based Instructional Strategies in teaching makes the environment of the classroom highly conducive for learning.The present study explored the effect of Brain Based Instructional Strategies on Achievement in Science of male and female secondary school students. It was quasi experimental in nature and pre-test post-test control group design was used. The sample of the study consisted ofsixtyfourclass IX students of a CBSE affiliated school in Chandigarh. The experimental group was taught using Brain Based Instructional Strategies and the control group was taught using Conventional Instructional Strategies for a period of two months.The pre and post test data were collected using Achievement in Science test, developed and standardised by the researcher. The data were analysed using ANOVA and effect size was also calculated.

1. Introduction

Education is a life-long process and a child spends considerable amount of time in school during the foundational years of learning. The schools give opportunities to students to learn and to prepare them for life. “How do we learn best” is the most pertinent question that philosophers, educators, psychologists have been pondering over for past many centuries. The latest to join the league of thinkers for past many decades are the neuroscientists. Teachers have been putting in efforts, devising methods and using what works best for their students, but all this while they had been teaching without much understanding of how brain works. Hart (1983) argues that “teaching without an awareness of how the brain learns is like designing a glove with no sense of what a hand looks like- Its shape, how it moves”.The increasing desire to know more about how brain learns has paved a way for a newer approach of teaching learning, called Brain Based Learning (BBL), which seems promising to bring phenomenal changes in education system. Jensen (2005, 2008) stated that “Brain Based education is the purposeful engagement of strategies that apply to how the brain works in the context of education.” He defined brainbased learning as ‘comprehensive approach to learning based on Neuroscience’. Brain based learning is the inter relationship among Psychology, Pedagogy and Neuroscience, in which discoveries from the brain sciences are applied to educational policy and teaching approaches. Caine and Caine (1997) advocated that if human brain needs to be utilized to its optimum, it is essential to use brain’s infinite capacity to make connections and understanding the supporting conditions to maximise it. They suggested that following three elements should be present for any complex learning to occur:

1. The relaxed alertness which is an optimal state of mind, consisting of low threat and high challenge.
2. The orchestrated immersion of the learner in multiple, complex and authentic experience.
3. The active processing of experience as the basis for making meaning.

The strategies that are used to execute brainbased learning are called Brain Based Instructional Strategies. Prigge (2002) suggested that brain based teaching strategies like smart thinking, drinking and eating, using music, laughter, positive visuals, creating an interactive environment, providing movement, being aware of internal and external attention, engaging emotions appropriately and specific recall techniques etc. can improve students’ achievement. Brain Based Instructional Strategies are based on the idea that instructional strategies are more effective if they occur in an environment compatible with the fact that brain is designed to learn (Sousa, 2001).

2. Significance of the Study

Science is inseparable unit of various academic fields and its impact can be felt in almost all walks of life. Teaching of science has become an unavoidable part of general education. It can justify its place in the curriculum by influencing young pupils’ way of thinking, in their habits of action and in the values they endure. Keeping in mind the importance of science in the present world, teachers must ensure effective science teaching in order to develop scientifically literate society.National Achievement Survey of class X (2015) revealed that 78% of students were performing below 50 percent in achievement in Science, which is an alarming figure. Kumar and Singh (2017) in their research paper elaborated on deteriorative state of science education in post-independence India and emphasised the need of understanding Science as a dynamic enterprise, applying scientific knowledge in real life

examples, innovative pedagogical strategies and reforms in science curriculum. Kapur (2018) described attitude of the students, school resources, skills and abilities of the teachers, classroom environment, social circle, psychological and health related factors, motivation and encouragement of the students and teaching learning methods as some of the factors influencing academic performance of the students. Brain Based Learning using Brain Based Instructional Strategies is promising approach in bringing the innovation into the classrooms to achieve the aims of teaching science and improved academic achievement in Science.

3. Objectives

1. To compare the mean gain scores of Achievement in Science of students taught through Brain Based Instructional Strategies and Conventional Instructional Strategies.
2. To compare the mean gain scores of Achievement in Science of Male and Female students.
3. To compare the mean gain scores of Achievement in Science of Male and Female students taught through Brain Based Instructional Strategies and Conventional Instructional Strategies.

4. Method

The present study was an experimental research. It employed quasi-experimental method using non-equivalent pre-test post-test control group design. Using lottery method, aCBSE affiliated secondary school of Chandigarh was randomly chosen for the study. The sample consisted of 64 students studying in two sections of Class IX. The two sections, having 32 students in each, were randomly assigned to control and experimental groups. After rapport building session, the researcher administered self constructed Achievement in Science Test on the both the sections as pre-test. These two intact sections were matched formean and standard deviation on pre-test scores of achievement in science to establish the equivalence between the groups.

Table 1 Showing Comparison of Pre-test Scores on Achievement in Science

Variable	Group	Mean	N	SD	SEM	df	t-value	p-value
Achievement in Science	Control	12.74	32	4.186	.737	62	1.709	.092
	Experimental	10.89	32	4.492	.794			

From Table 1, it can be seen that the t-value is 1.709 which is not significant. It shows that the mean of pre testscores of Achievement in Science of control and experimental group students do not differ significantly. It may, therefore, be said the students of control and experimental group were found to be similar on pre-test scores ofachievement in science and hence the equivalence between the groups was established.

The control group was taught using Conventional Instructional Strategies and the experimental group was taught using Brain Based Instructional Strategies. The experiment was conductedfor a period of one month, each class lasting for duration of 40 minutes, with regular feedback from students as an important part of instructional strategy.Lesson plans were formulated for both control and experimental group from two chapters of Science textbook, prescribed by NCERT. In order to control the teacher bias, both the groups were taught by the researcher.

After completion of experiment, the Achievement in Science test was re-administeredon thestudents of control and experimental groups. From these obtained scores gain scores on achievement in science were calculated by taking the difference of post test scores and pre test scores, analysis was done using ANOVA and results were interpreted at 0.05 level of significance.

5. Result

The results of analysis of obtained mean gain scores on Achievement in Science using ANOVA are given in Table 2.2.

Table 2.1 Showing Descriptive Statistics of Mean Gain Scores of Achievement in Science

Group	**Gender**	**Mean**	**Std. Deviation**	**N**
Control	Male	15.2603	10.91288	14
	Female	20.5327	7.97741	18
	Total	18.2260	9.58656	32
Experimental	Male	35.9662	9.23941	17
	Female	35.6710	6.09780	15
	Total	35.8278	7.80225	32
Total	Male	26.6152	14.38245	31
	Female	27.4138	10.42447	33
	Total	27.0269	12.40409	64

Table 2.2 Showing Summary of Analysis of Variance on Mean Gain Scores of Achievement in Science

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	5088.863	1	5088.863	67.604	.000	.530
Gender	98.119	1	98.119	1.303	.258	.021
Group * Gender	122.784	1	122.784	1.631	.206	.026
Error	4516.481	60	75.275			
Corrected Total	9693.267	63				

From Table 2, it can be seen that there is statistically significant difference, $F\ (1, 60) = 67.604,\ p < 0.01,\ \eta_p^2 = .530$, between the mean gain scores of Achievement in Science of students taught through Conventional Instructional Strategies and Brain Based Instructional Strategies. The mean for gain scores of control group i.e. the students taught through Conventional Instructional Strategies was found to be 18.22 and mean for mean scores of experimental groups i.e. the students taught through Brain Based Instructional Strategies was found to be 35.82. The comparison of two means showed the students taught through Brain Based Instructional Strategies performed better on Achievement in Science than the students taught through Conventional Instructional Strategies. The difference in the mean of gain scores of Achievement in Science of students of control and experimental groupsis shown graphically figure 1.

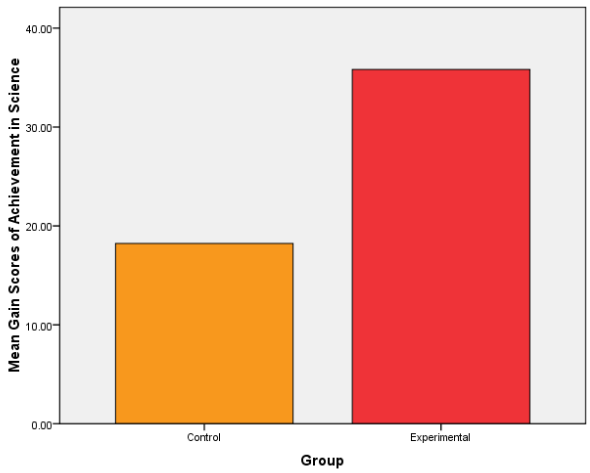

Figure 1 Showing Mean of Achievement in Science for Control and Experimental Group

The value of partial eta squared (η_p^2) was found to be .530 indicating that 53% of total variance of Achievement in Science is explained by the main effect of Instructional Strategies, which is large effect size (Cohen, 1988).

From Table 2, it can be seen that there is statistically no significant difference, $F\ (1, 60) = 1.303,\ p = .258,\ \eta_p^2 = .021$, between the mean gain scores of Achievement in Science of male and female students. The mean for gain scores of male students was found to be 26.61 and mean for gain scores of female students was found to be 27.41. The comparison of two means showed the male and female students performed similar on Achievement in Science. The difference in the mean of gain scores of Achievement in Science of male and female students is shown graphically figure 2.

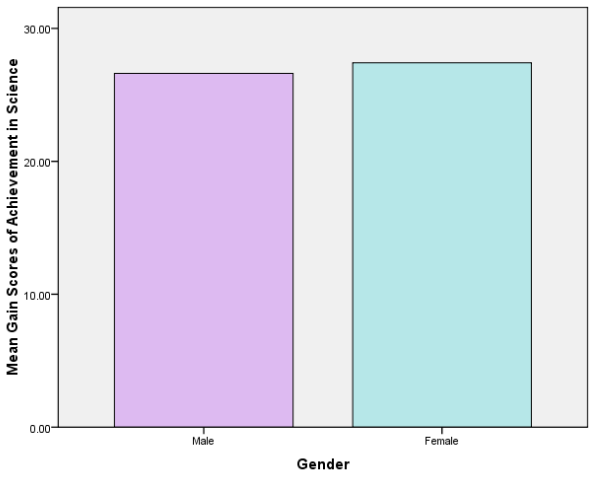

Figure 2 Showing Mean of Achievement in Science for Male and Female Students

The value of partial eta squared (η_p^2) was found to be .021 indicating that only 2.1% of total variance of Achievement in Science is explained by the gender, which is small effect size (Cohen, 1988).

From Table 2, it can be seen that there is statistically no significant interaction effect, *F (1, 60) = 1.631, p = .203,* η_p^2 = *.026*, of Instructional Strategies on mean gain scores of Achievement in Science of male and female students. Figure 3 shows there is interaction between Instructional Strategies and Gender that affects the mean gain scores of Achievement in Science, as the lines are intersecting at a point but this interaction is not statistically significant.

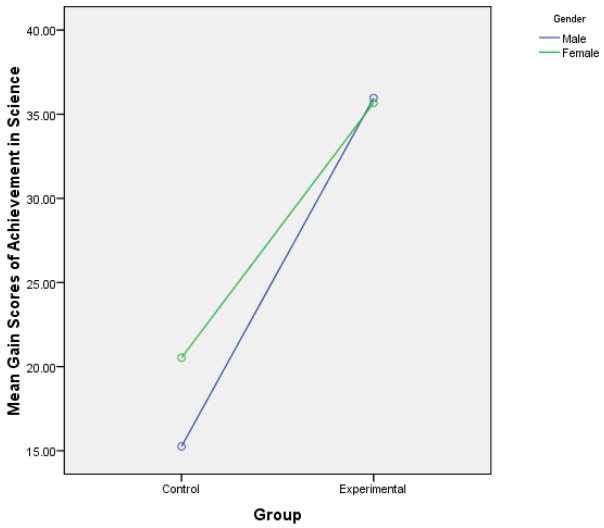

Figure 3 Showing Interaction Effect of Instructional Strategies and Gender on Mean Scores of Achievement in Science

The value of partial eta squared (η_p^2) was found to be .026 indicating that only 2.6% of total variance of Achievement in Science is explained by interaction effect of Instructional Strategies and Gender, which is small effect size (Cohen, 1988).

6. Discussion

The results of the study indicated that difference in mean gain scores of Achievement in Science of experimental group and control group was statistically significant showing students taught using Brain-Based Instructional Strategies performed better than the students taught using Conventional Instructional Strategies. The results of the study are in congruence with findings of Al-Balushi and Al-Balushi (2018), Ali, Ghazi, Shahzad and Khan (2010), Altiti (2014), Bawaneh, Nurulazam, Saleh and Kanesan (2012), Chavhan (2012),Dilek and Rahmi (2007), Inci and Erten (2011), Iscen and Yucel (2013), Ramakrishnan (2015), Saleh (2011), Shabatat and Al-Tarawneh (2016), and Sharma (2013), Varghese and Pandaya (2016), Vyas and Vashistha (2013)who conducted studies to ascertain the effect of Brain Based Instructional Strategies on achievement in Science. All the studies were experimental in nature and were conducted on different classes in India and in other countries. The classes varied from grade 5 to grade 12 and results of all the studies showed that brain based instructional strategies had positive and statistically significant effect on achievement in Science. The reason for it is that when students are taught using Brain Based Instructional Strategies, where learning takes place in the environment supporting relaxed alertness, orchestrated immersion and active processing, it makes learning more meaningful for the students, resulting in better understanding and retention of the concepts leading to higher academic achievement.

The results of the present study related to effect of gender were found to be in contradiction with the results of the study conducted by Chavhan (2012) who reported significant interaction effect of Brain Based Instructional Strategies and gender on achievement of students.

7. Conclusion

The study was carried out to find out the effect of Brain Based Instructional Strategies on Achievement in Science of male and female secondary school students of Chandigarh. Three main conclusions were drawn from the present study. *First,* that the difference between mean gain scores of students on Achievement in Science test, taught using Brain Based Instructional Strategies was found to be statistically significant than those taught through Conventional Instructional Strategies.*Second,* that there was not statistically significant difference in mean gain scores of achievement in Science between male and female students and *third,* that there was no effect of interaction between teaching strategy and gender on the mean gain scores of achievement in Science.

8. Suggestions

The review of the literature reflected that very few studies have been conducted in Indiaon Brain Based Learning. More studies need to be conducted in Indian context to study the effect of Brain Based Instructional Strategies on academic achievement of the students. The study can be replicated with the same subject in same region with different sample of secondary school students to validate the results of the present study. A similar study can be taken up with different school subjects in same region or in different region of country. The studies on Brain Based

Instructional Strategies have been carried out from kindergarten till university classes, so on same lines the studies can be carried out taking different classes for Science as well as for other subjects.

References

1. Al-Balushi, K. A., & Al-Balushi, S. M. (2018). Effectiveness of brain-based learning for grade eight students' direct and postponed retention in science. *International Journal of Instruction*, *11*(3), 525-538. doi:10.12973/ iji.2018.11336a
2. Ali, A., Ghazi, S. R., Shahzad, S., & Khan, H. (2010). The impact of brain based learning on students' academic achievement. *Interdisciplinary Journal of Contemporary Research in Business*, *2*(2), 542. Retrieved from http://connection.ebscohost. com/c/articles/59543282/impact-brain-based-learning-students-academicachievement
3. Altiti, M. (2014). The impact of a brain-based teaching program on improving the achievement of 5th grade students in sciences. *Journal of Islamie University*, *22*(1).
4. Bawaneh, A., A. K., Nurulazam, Md., A. N., Saleh, S., &Kanesan, K, A. G. (2012). The effect of a brain-based teaching method on conceptual change in students' understanding of electricity. *Eurasian Journal of Physics and Chemistry Education*, *4*(2), 79-96. Retrieved from https://www.researchgate.net/ publication/ 259866423
5. Caine, R. N. & Caine, G. (1997). *Education on the Edge of Possibility.* Alexandria: Association for Supervision and Curriculum Development.
6. Chavhan, R. K. (2012). *Development of an intervention programme on brain based learning strategies*, (Unpublished doctoral dissertation). S.N.D.T Women's University, Mumbai, India. Retrieved from http://hdl.handle.net/10603/9368
7. Cohen, J. (1988). F tests on means in the analysis of variance and covariance. In *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum associates publishers.
8. Dilek, E. A., &Rahmi, Y. (2007). A study on impact of brain-based learning approach on students' achievement and retention of knowledge about "work-energy" topic. Retrieved from https://www.scribd.com/document/198979297/ 97-Erduran-Avc-A STUDY-ON-IMPACT-OF-BRAIN-BASED-LEARNING-APPROACH-ON STUDENTS-ACHIEVEMENT-AND-RETENTION-OF-KNOWLEDGE-ABOUT-WORK-ENERGY-TOPIC
9. Hart, L. A. (1983). Human brain and human learning. Retrieved from http://brainconnection.brainhq.com/2004/03/26/what-is-brain-based-learning/
10. Inci, N., &Erten, H. (2011). The effect of brain based learning on academic success, attitude and retrieval of information in science and technology classes. *University of Firat, Elazig, Turkey*. Retrieved from https://docplayer.net/26504615-The-effect-of-brain-based-learning-on-academic-success-attitude-and-retrieval-of-information-in-science-and-technology-classes.html
11. Iscen, C. F., &Yucel, C. (2013). The effect of a brain-based learning approach on 8th grade student achievement, attitudes and retention of knowledge in a science and technology lesson. *Social and Educational Studies*, *5*(4), 613-626.
12. Jensen, E. (2005). *Teaching with the brain in mind* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.
13. Jensen, E. (2008). *Brain-based learning: The new paradigm of teaching* (2nd ed.). New Delhi, India: SAGA India Pvt.Ltd.Jenson, E (2008) What is Brain-Based Learning? Retreived from http://feaweb.org/brain-basedlearning-strategies.
14. Kapur, R (2018). *Factors influencing the students academic performance in secondary schools in India*. Retrieved from https://www.researchgate.net/publication/324819919
15. Kumar, R. & Singh, S. (2017). The state of science education in post independent India: A synoptic review and future direction. doi. 10.9790/0837-2203135558
16. National Achievement Survey (2015). *A summary of national achievement survey class X*. Educational Survey Division, NCERT, New Delhi.
17. Prigge, D. J. (2002). Promote brain based teaching and learning. *Intervention in School and Clinic, 37(6)* 237–241.
18. Ramakrishanan, J. (2015). *The effect of brain-based learning strategy on academic achievement and creativity among secondary school students* (Unpublished doctoral dissertation). Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India. Retrieved from http://hdl.handle.net/10603/110825
19. Saleh, S. (2011). The effectiveness of brain-based teaching approach in dealing with the problems of students' conceptual understanding and learning motivation towards physics. Educational Studies (forthcoming article). Routledge, Taylor & Francis Group. http://www.informaworld.com/smpp/content~db=all~ content=a937532556.
20. Shabatat, K., & Al-Tarawneh, M. (2016). The impact of a teaching-learning program based on a brain-based learning on the achievement of the female students of 9th grade in Chemistry. *Higher Education Studies*, *6*(2), 162. doi:10.5539/hes.v6n2p162
21. Sharma, A. (2013). *The effect of brain based instructional strategies on achievement and self esteem of science student in relation their learning style,* (Unpublished doctoral dissertation). Panjab University, Chandigarh, India.
22. Sousa, D. A. (2001). *How the special needs brain learns.* Thousand Oaks, Ca: Corwin Press.
23. Varghese, M. G., & Pandya, S. (2016). A study on the effectiveness of brain-based- learning of students of secondary level on their academic achievement in biology, study habits and stress. *International Journal of Humanities and Social Sciences*, *5*(2), 103-122. Retrieved from https://www.researchgate.net/ publication/301816156
24. Vyas, K., &Vashishtha, K. C. (2013). Effectiveness of teaching based on brain research with reference to academic achievement of secondary school students. *International Journal of Students Research in Technology & Management*, *1*(4), 383-397. Retrieved from http://www.giapjournals.org/uploads/2/6/6/2/26621256/effectiveness_of_ teaching_based_on_brain_research_with_reference_to_academic_achievement_of_secondary_school_students.pdf

