ISSN- 2349-7076

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter)
Patron: Prof. R. G. Kothari
Chief Editor: Prof. Jignesh B. Patel
Email:- Mo. 9429429550 ctefeduinspire@gmail.com

EduInspire

- An International Peer Reviewed and Refereed Journal

Vol: XIII
Issue: I
January-2026

Patron
Prof. R. G. Kothari

Chief Editor
Prof. Jignesh B. Patel
Mo. 9429429550
drjigp@gmail.com
ctefeduinspire@gmail.com

Council for Teacher Education Foundation

(CTEF, Gujarat Chapter)

ISSN- 2349-7076

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter)
Patron: Prof. R. G. Kothari
Chief Editor: Prof. Jignesh B. Patel
Email:- Mo. 9429429550 ctefeduinspire@gmail.com

Effect of Brain-Based Learning Strategies on Attitudes toward Science of Middle-Level Students

Dr. Saloni
Assistant Professor, Central Institute of Hindi, Agra (U.P.)
dr.saloni200873@gmail.com

Abstract

This research examines how middle-level students' attitudes toward science are affected by brain-based learning (BBL) strategies. Drawing from neuroscience principles, brain-based learning prioritizes instructional strategies that complement the brain's natural information processing, encouraging active participation, emotional bonding experiences. According to the research, students' attitudes and perceptions of science may be improved by using these tactics in the classroom. The researcher used true experiment design & two group pre-test post-test design. In middle level, researcher chose the seventh class. Samples of sixty students from class VII of Shri Mati Shanti Devi Inter College Agra (U.P. board) were used in this work. The school was choosing through use by technique of purposive sampling. The students were randomly assigned to two groups using the lottery method of simple random sampling: groups for the experiment and the control. Active experiment group is taught using the techniques of B.B.L.S. whereas the normal control group is taught by conventional method of teaching. To conduct statistical analysis, the researcher used SPSS 20. These findings imply that middle-level students' attitudes toward science may improve as a result of brain-based learning, which may also increase their interest and drive to pursue science-related courses of study and careers. An efficient method is to use brain-based learning techniques.

Keywords: Brain-Based Learning Strategies, Attitude towards Science, Middle-level students, NEP (2020), Innovative Teaching

Introduction

The subject of how neuroscience can promote effective teaching approaches has attracted more attention in recent years. According to how the brain receives and stores data, BBL has emerged as a powerful instrument for enhancing student learning. Making use of knowledge about memory, emotion, and sensory input, BBL strategies incorporate the idea of improving efficiency and the enticement of learning. For subjects such as science, where the demonstrated positivity is shown to impact on longevity and achievement, these strategies

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

may be particularly beneficial to middle level students, who are in formative developmental category.

Attitude towards Science

A Science attitude of a country determines its advancement, inventiveness, and general development of the country scientific literacy it is meaning that improved or novel objects, events, or processes that occur in today's fast pacing world requires students' to exhibit a favourableness' attitude towards science' in every educational setting to foster their critical thinking skills, curiosity, and problem-solving skills. Being so imperative, India's National Education Policy (2020) brings several overhauls to the nation's science courses. As will be observed from NEP (2020), by developing a learning setting where students are able to test their ideas, and learn science aided by principles of scientific practice common to different scientific disciplines and used to address challenges within society, the developmental goals are successfully set as a first step to ensure critical thinking begins from the early ages of education. The policy attempts to promote positive attitude toward science in students, by moving from knowledge- based approach to experience and practical knowledge. Students entering higher education institutions will transform into a new generation of scientists, researchers, and innovators able to contribute to the development of the country and promote its advanced scientific development abroad; the given shift carries out a task of making scientific studies more engaging and accessible for learners. Promoting specific attitudes to science and enhancing young people's tendency to choose a career in science is one of the objectives of science education (Tai et al., 2006; Cetin & Azizoglu, 2009). Therefore, attitudes towards science comprise of feeling, beliefs, and value about something, including the enterprise of science, school science, as well as.

Concept of Learning is based on Brain (B.B.L.)

To development of curricula and lesson plans is informed by neuroscience in B.B.L. Gain knowledge quickly & effectively is its aim. According to Education Reform, this approach is based on research that shows how the brain can adapt & reorganize it reflect how a person acquires new knowledge. Stress level, diet, and exercise all have an impact on this ability. A person's emotional state affects their capacity to learn as well. As a result, learning new skills gets easier the more you practice them. Teachers use this research as a starting point to apply the concepts of B.B.L. in the classroom. In particular, they emphasize lowering stress, efficiently imparting knowledge, encouraging students to move better & incorporating hopes'. While the principles remain consistent for all students' ages,

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

learning does change as people get older. As a result, these principles' delivery methods change appropriately.

History of Brain-Based Learning

The 1990s saw a surge in neurological research. The left and right brain theory, which was decades old and initially suggested in the 1960s, and little were known about neural pathways until this time. In light of information provided by the Global Digital Citizen Foundation, it is evident that the brain has amassed substantially more knowledge in the 1990s than all previous centuries combined. The significant findings of the research conducted by Geoffrey Caine and Renate Nummular Caine in 1994 demonstrate were better able to retain and comprehend material when they were in a B.B.L. environment. Since then, schools have increasingly adopted B.B.L. Caine and Caine (1991, 1992) used learner-centred learning strategies and pedagogical approaches to apply the results of structural brain research to the teaching and learning process. The twelve theoretical principles for implementing the idea of B.B.L. in the classroom were provided beyond Caine and Caine (1991).

An analysis of relevant literature

As presented in the overview of relevant literature, Brain-Based Learning Strategies is employed to design tasks and activities, increase achievements, increase memory retention and develop motivation, perseverance, and right attitude towards learning. The B.B.L.S. was more relevant in raising students' performance than control group's traditional method as revealed by Duman. (2010). R. Sari. Suyanto as well. (2019) also revealed that the learning outcomes of the second-grade biology students are positively impacted by the B.B.L. model. Through in a research work undertaken alongside Akman, P., Yapici, A., Kutlu, M. O., Tuncel, F., & Demiroglari, G. (2020)an et al. (2020), it was ascertained that the teaching of English lessons using BBL Theory with Experiment Class enhanced achievement more than the Control Class taught using conventional methods. The BBL Theory could be used as the foundation for developing new methods for taught English; therefore, it's proposed that further research should be conducted in this area. K. Kandasamy. N. Ibrahim. O., et al. The following study proved that using the brain B.B.L.S. style was effective to enhancing the teaching result by enabling student to have a better understanding, recognize and grasp better words than the students who were taught traditionally. However, Amjad, A. Me. Habib, M., and others. Advocated for teachers to incorporate activities, that have the BBL principles, in teaching mathematics to elementary schools with the aim of improving students' performance in the subject. Similarly, Susriyati, Nita & Suleisetijono (2023).

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Objective of the Research Paper

1. To study the effect of B.B.L. strategies on attitudes toward science of middle school students.

Hypothesis of the Research Paper

H_a1: There will be a significant effect of B.B.L. strategies on attitudes toward science of middle-level students.

Design and Methodology of the Research

Design involving two groups with phases for pre-testing and post-testing and an experimental approach were utilized throughout the research work.

Table 1 Design of Research Work

First Phase- To Plan						
Second Phase-Implementation						Third Phase-Evaluation
Sr. No.	Group	Pre-test	Intervention	Time		Post-test
				Period	Total Time	
1.	Experimental Group	Attitude towards Science	Teaching Based on Brain Based Learning Strategies (Lesson Plan and instructional material used which based on B.B.L.S.)	40 m	25 Days	Attitude towards Science
2.	Control Group		Teaching Based on conventional approach.	40 m	25 Days	

Selection of Sample

A sample of sixty middle-level students' of class VII was chosen from Shri Mati Shanti Devi Inter College Agra U.P. Board. Purposive sampling was used to choose the school. Then, using the lottery approach, 60 students were chosen by random among the 78 students in class VII, and they were split into two groups.

Selected tool in the Study

Attitude Towards Science - The researcher selected the tool Anuradha Agnihotri (Revised 2023) for attitude towards science, considering the objectives and sample level of her research. The attitude towards the science tool was given by Anuradha Agnihotri in 2009 this tool has been revised in 2023. 25 items in this tool.

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Table 2 Intervening variables-controlled techniques

Intervening variables	Method
Year	Stability
Time of study Period	Stability
School diversity	Selection
Teacher (Researcher)	Stable

Instrument was normalized for class VII students. Reliability was obtained 0.82

The study's methodology

Researcher choosing ten lessons from the seventh-grade science textbook published by NCERT, there are twenty lesson plans that use brain-based learning strategies and twenty that use the conventional approach. The researcher instructed to the control and experiment groups. The experimental group was instructed in stress-reduction techniques, ice-breaking techniques, concept mapping, chunking, visual elements, and brain-based learning strategies. The entire treatment process took 25 days. The researcher first assesses attitudes of the experiment and control groups toward the science subject using pre-test scores. Following treatment, a post-test of the experiment & control groups attitudes toward science was administered by the researcher. Controlled variables: During the intervention, there are a few unrelated factors that may have an impact on the outcomes, such as age, class, study period, school diversity, etc.

Data Analysis

Firstly, the researcher checks the normal distribution using the Shapiro-Wilk test.

H_a1: There will be a significant effect of B.B.L. strategies on attitudes toward science of middle-level students.

To study the attitude towards science of middle level students (class- VII) students, the researcher administered the Attitude Test towards Science (2023, Revised Edition) created by Anuradha Agnihotri and conducting the experiment. To find out the effect of B.B.L.S., the pre- & post-scores of the attitude test towards science have been analysed in the following order: Examining the normal distribution of attitude towards science pre-scores.

- Comparison of both groups' pre-test scores for attitude toward science.
- Comparison of both groups' post-test scores for attitude toward science.

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Examining the normal distribution of attitude towards science pre-scores

The researcher has determined the distribution of normality of the data by two methods: numerical and visual methods. Under the numerical method, the Shapiro-Wilk test was used, and under the visual method, the histogram and Q-Q plot were used.

Table 3: Shapiro-Wilk test on Attitude towards Science pre scores

Pre-test	Shapiro Wilk-test			skewness	Skewness-z value	kurtosis	Kurtosis-z value
Attitude towards Science	Stati. Value	Df	Level of significance				
Experiment group (N=30)	.954	30	.218	.55	1.30	.23	.28
Control group (N=30)	.966	30	.428	.18	.42	1.25	1.5

Table 3 shows that p value (.218 and .428 respectively) were higher than the Shapiro-Wilk value (05). For the both groups, the corresponding z-value of skewness & kurtosis are 1.30, .42, .28, and 1.5, which fall between -1.96 and +1.96. Therefore, the pre-test data distribution pertaining to attitudes toward science is normal.

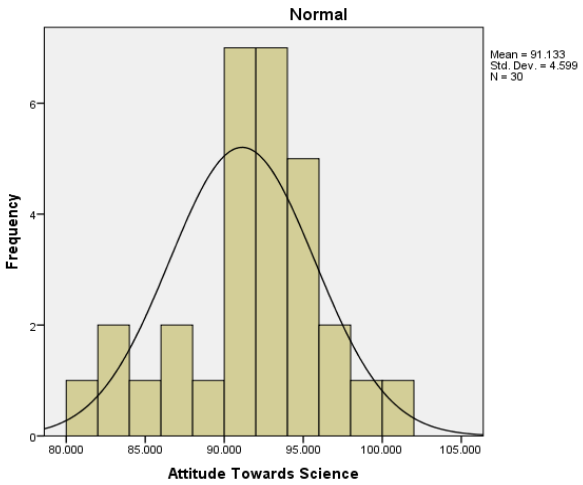


Figure 1 Normal probability curve of experimental group pre-test scores for attitude toward science

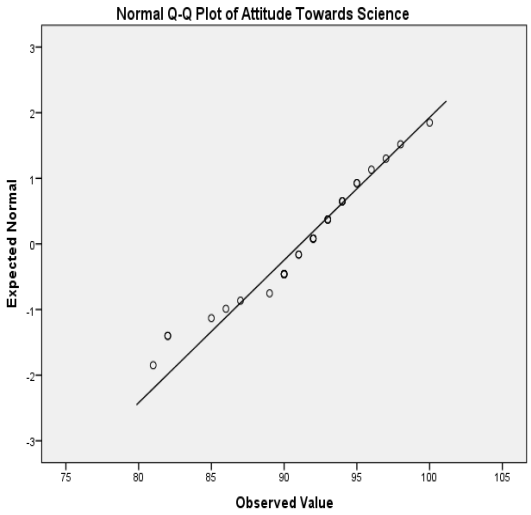


Figure 2 Q-Q plot of experimental group pre-test scores for attitude toward science

It is clear from the above figure number 1 and 2 that the distribution of experiment group pre scores for attitude toward science is normally distributed and it is also clear from the line of

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Q-Q plot that the deviation of the data is negligible. In conclusion, the data are normally distributed.

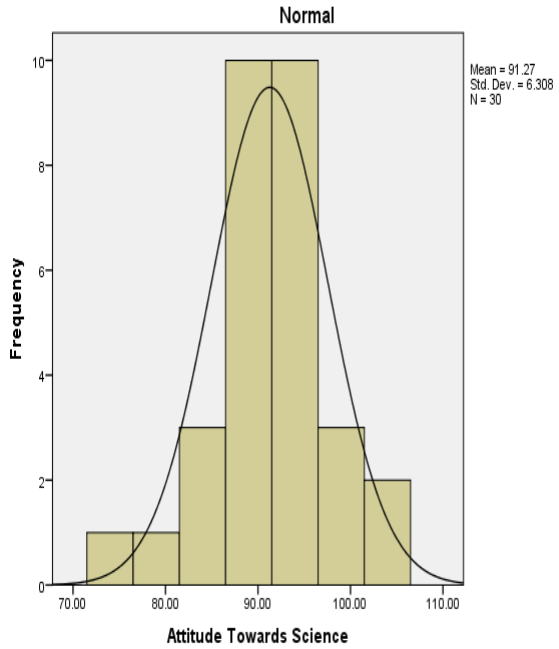


Figure 3 Normal probability curve of control group pre-test scores for attitude toward science.

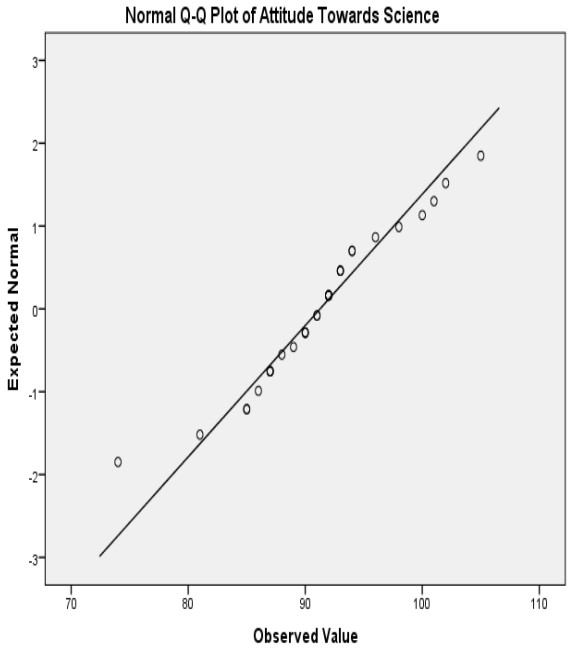


Figure 4 Q-Q plot of control group pre-test scores for attitude toward science

It is clear from the above figure number 3 and 4 that the distribution of control group pre scores for attitude toward science is normally distributed and it is also clear from the line of Q-Q plot that the deviation of the data is negligible. In conclusion, the data are normally distributed.

Table 4. Comparison of both Group Pre-Test scores for attitude toward science

Group	No.	M	S.D.	Df	Value of 't'	Significance Level
Experiment Group	30	91.13	4.59	58	.094	Not significant at 0.05
Control Group	30	91.27	6.30			

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

The attitudes toward science pre scores in both groups have a mean of 91.13 & 91.26, with a S.D. of 4.59 & 6.30. In both groups, Attitude towards Science pre-test t-value is .094, which is below the significance level 0.05 table value (1.96). This demonstrates that students in both groups have the same attitude toward science.

The accompanying Figure 5, which shows the mean & S.D. of the students', makes it clear that both groups of students performed similarly in the pre-exam.

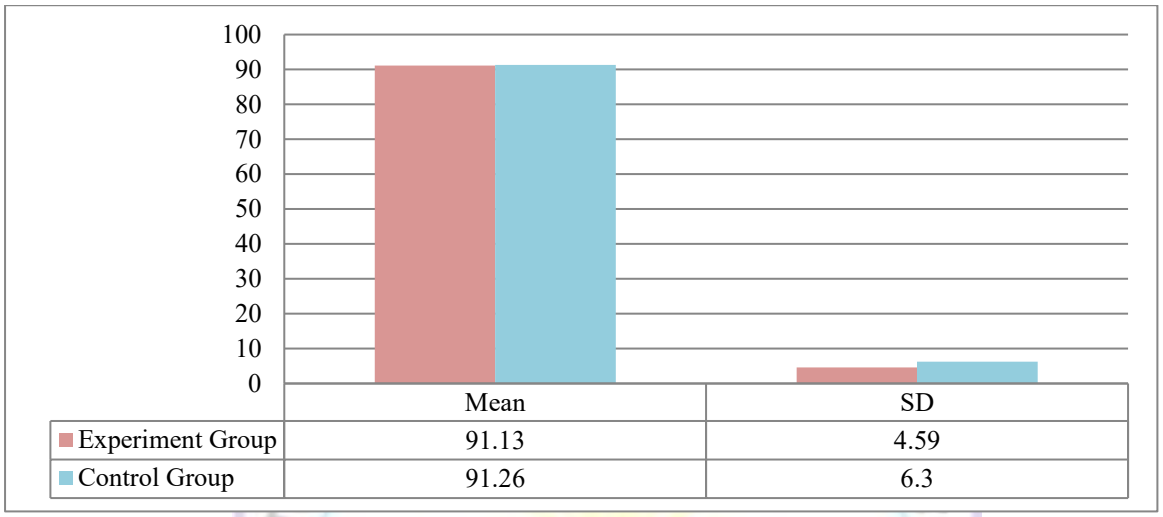


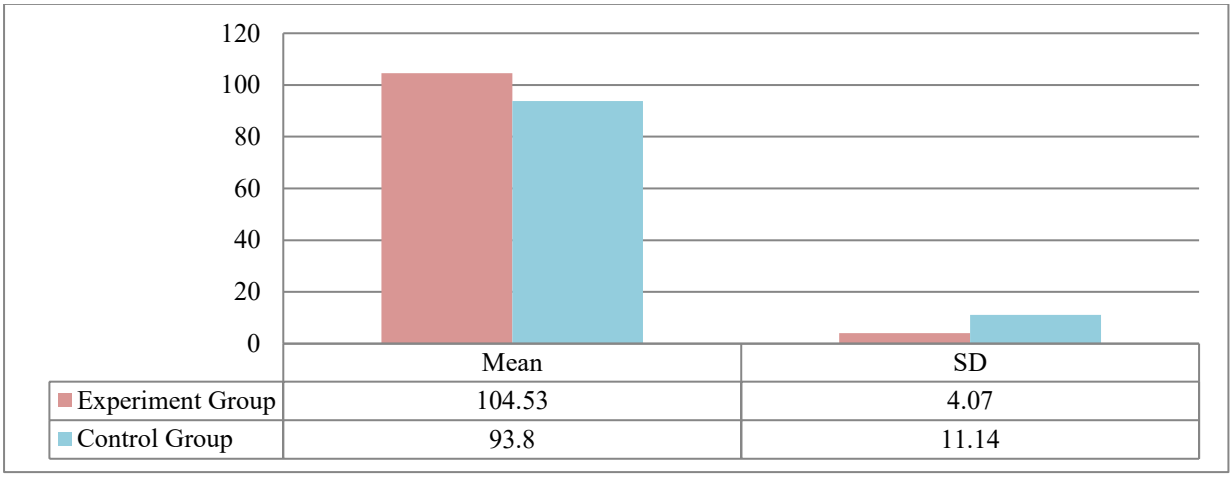
Figure 5. Mean & S.D. of the students

Table 5. Comparison of both group post test scores for attitude toward science

Group.	No.	M	S.D.	Degree of Freedom	Value of t	Significance Level
Experiment Group	30	104.53	4.07	58	4.95	0.01
Control Group	30	93.80	11.14			

The attitudes toward science post scores in both groups have a mean of 104.53 and 93.80 with S.D. of 4.07 & 11.14. In both groups, the Attitude towards Science post-test t-value is 4.95, which is higher than the significance level 0.01 (2.58). This demonstrates that students in both groups have different attitudes toward science. The post-test Mean and S.D. of the students' attitudes toward science are shown in Figure 6 below. Now we can see that the experimental group's performance in the post-exam was nearly good.

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com



	Mean	SD
Experiment Group	104.53	4.07
Control Group	93.8	11.14

Figure 6 (above mentioned) makes it evident that the Ex. group attitude towards science mean is higher than the Con. group. This demonstrates that the teaching methodology, which was based on brain-based learning methodologies, improved the students' attitude toward science in class VII. Following data analysis, it was shown that teaching using B.B.L.Strategies was superior to teaching using traditional approaches in terms of improving students' attitudes toward science.

Conclusion

From the study, the author discovered the powerful impact of brain-based learning (B.B.L.S.) on middle-level students' perceptions of science. Students performed better and demonstrated greater interest, confidence and enthusiasm for the subject, which is in compliance with the teaching model best suited to the brain – participation, engagement of more than one sense and feeling emotionally involved. According to the results presented, BBL techniques enhance a more positive form of learning by fostering students' perceptions of science concepts as approachable and relevant. Use of B.B.L.S. rather than the conventional method of teaching made the students have better attitudes towards classes; interfered in the classroom; and wanted to learn more about science apart from what they were taught in class. These improvements suggest that BBL can advance pedagogy in science at a critical developmental age, and this may in the future affect the participation of students in science programs. In conclusion, the application of brain-based practices into science at middle school may well improve the performance of students, establish a favourable attitude toward the learning of science for longer time. Besides looking into the possibilities of how BBL can be applied to other content areas for even more overall benefits, later research should explore

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

farther consequences of the above-mentioned strategies on students' achievement and occupational preferences in science.

References

Abdolmaleki, N., & Saeedi, Z. (2024). Brain-based CALL in flipped higher education GE courses held through LMS: Boosting vocabulary learning and reading comprehension. In *International Journal of Educational Technology in Higher Education* (Vol. 21, Issue 1). https://doi.org/10.1186/s41239-024-00442-9

Akman, P., Yapici, A., Kutlu, M. O., Tuncel, F., & Demiroglari, G. (2020). The Effect of English Teaching on Academic Achievement Based on Brain Based Learning Theory (BBL). *African Educational Research Journal*, 8(8), 158–163. https://doi.org/10.30918/AERJ.8S2.20.043

Amjad, A. I., Habib, M., & Saeed, M. (2022). Effect of Brain-Based Learning on Students' Mathematics Performance At Elementary Level. *Pakistan Journal of Social Research,* 04(03), 38–51. https://doi.org/10.52567/pjsr.v4i03.684

Best, J. W., & Kahn, J. V. (1996). Research in education (7th ed., Vol. 10). Prentice-Hall of India Brain structure and function: Brain injury: British Columbia. *Northern Brain Injury Association British Columbia.* (2017, January 31).https://www.nbia.ca/brain-structure-function/

Caine, R. N., & Caine, G. (1991). Making connections teaching and the human brain (1st ed., Vol. Ser. 11-91025) https://files.aric.ed.gov/fulltext/ED335141.pdf

Cohen, L., Manion, L., & Morrison, K. (2011). Research methods in education Routledge. *American Psychological Association.* (2023). https://www.apa.org/pubs/books/attention-sample-pages.pdf

Crocker, J., & Wolfe, C. T. (2001), Contingencies of self-worth. *Psychological Review,* 108(3)593-623. https://doi.org/10.1037/0033-295.108.3.593

Doyon, J., & Benali, H. (2005), Reorganization and plasticity in the adult brain during learning Of motor skills. *Current Opinion in Neurobiology,* 15(2), 161-167. https://doi.org/10.1016/j.comb.2005.03.004

Freeman, G. G., & Wash, P. D. (2012, November 30). You can lead students to the classroom, and you can make them think: Ten brain-based strategies for college teaching and learning success. *Journal on Excellence in College Teaching*. https://eric.ed.gov/?id=EJ1026152

Funa, A. A., Ricafort, J. D., Jetomo, F. G. J., & Lasala, Jr., N. L. (2024). Effectiveness of Brain-Based Learning Toward Improving Students' Conceptual Understanding: A Meta-Analysis. *International Journal of Instruction,* 17(1), 361–380. https://doi.org/10.29333/iji.2024.17119

Hart, L. A. (1983). Human brain and human learning. New York: Longman.

Harjono, A., Andani, T. G., Gunada, I. W., & Susilawati, S. (2022). Implementation of Blended-Flipped Classroom Model Assisted by Video to Improve Students' Creative Thinking Skills. *In Jurnal Penelitian Pendidikan IPA* (Vol. 8, Issue 6, pp. 3180–3186). https://doi.org/10.29303/jppipa.v8i6.2255

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Hofman, M. A. (2014). Evolution of the human brain: When bigger is better. *Frontiers in Neuroanatomy*, 8. https://doi.org/10.3389/fnana 2014,00015

Kandasamy, K., Ibrahim, N. A., Jaafar, H., & Hanafi Zaid, Y. (2021). Enhancing Vocabulary Acquisition and Retention Through the Brain-Based Learning Strategies. A*JELP: Asian Journal of English Language and Pedagogy*, 9(2), 26–42. https://doi.org/10.37134/ajelp.vol9.2.3.2021

Lombardi, J. (2008). Beyond learning styles: Brain-based research and English language Learners. The Clearing House: *A Journal of Educational Strategies, Issues and Ideas,* 81(5). 219-222. https://doi.org/10.3200/tchs 81.5.219-222

National education policy 2020-Ministry of Education. (2020). https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English.pdf

National curriculum framework for school eduation 2023-Ministry of Education. (2023). https://www.education.gov.in/sites/upload_files/mhrd/files/NCFSE_Final_English.pdf

Ozden, M. (2015, November 6). The effects of brain-based learning on academic achievement And Retention of knowledge In science course. Academia.edu.https://www.academia.edu/17866449/The_Effects_of_Brain_Based_Learning_on_Academic_Achievement_and_Retention_of_Knowledge_in_Science_Course'email_work_card-title

Pacheco, B. M., de Oliveira, V. H. R.. Antunes, A. B. F., Pedro, S. D. De S., & Silva, D. (2023, July 11). Does pre-training on brain-related tasks result in bener deep-learning-based brain age biomarkers? arXiv.org. https://arxiv.org/abs/2307.05241

Posner. M. L, & Rothbart, M. K. (2023). How understanding and strengthening brain 25822160 , 2456 4184 rd 8.76 networks Can contribute to elementary education. *Frontiers in Public Health,* 11. https://doi.org/10.3389/fpubh.2023.1199571

Ramakrishnan, J. (2016, January 19). Brain-Based Learning Strategies. Academia.edu. https://www.academia.mdu/20384764/Brain_based learning strategies

Sari Rahmatin, L., & Suyanto, S. (2019). The use of brain based learning model in classroom. *Journal of Physics: Conference Series,* 1241(1). https://doi.org/10.1088/1742-6596/1241/1/012027

Saloni & Kulshreshtha, A.K.(2024).EFFECT OF BRAIN BASED LEARNIN STRATEGIES ON CREATIVE THINKING OF MIDDLE LEVEL STUDENTS.*Shodhkosh :Journal of Visual and Arts*,5(5),575-580. https://doi.org/10.29121/ Shodhkosh .v5i5.2024.2041

Smitha M Reddy, R. H. (2021). Inlfuence of Brain-Based Learning Stratgies on Academic Motivation, Stress and Self-Esteem of High School Students in North Banagalore. *In Psychology and Education Journal* (Vol. 58, Issue 2, pp. 6329–6332). https://doi.org/10.17762/pae.v58i2.3154

Singh, V. (2020). Achievement in Science and Attitude towards Science Practical among Secondary School Students of Patna. *Journal of Teacher Education and Research*, *15*(02), 15–19. https://doi.org/10.36268/jter/15205

Susriyati, M., Nita,N., Herawati,S., & Sulisetijono. (2023). Brain-Based Learning-Reading, Mind Mapping, and Sharing (BBLRMS) Model to Enhance Creative Thinking Skills of Pre-Service Biology Teachers. *Pegem Journal of* Education *and Instruction,* 13(3), 191–202. https://doi.org/10.47750/pegegog.13.03.20

EduInspire-An International E-Journal
An International Peer Reviewed and Referred Journal (www.ctegujarat.org)
Council for Teacher Education Foundation (CTEF, Gujarat Chapter) Email:- ctefeduinspire@gmail.com

Suwistika, R., Ibrohim, I., & Susanto, H. (2024). Improving Critical Thinking and Creative Thinking Skills through POPBL Learning in High School Student. In *JPBI (Journal Pendidikan Biologi Indonesia)* (Vol. 10, Issue 1, pp. 115–122). https://ejournal.umm.ac.id/index.php/jpbi/article/view/30172

Wilson, A., Ramanair, J., & Rethinasamy, S. (2024). The Effects of Brain-based Learning Strategies on Low Ability Malaysian English as a Second Language Learners' Writing Performance. *Pertanika Journal of Social Sciences and Humanities,* 32(2), 345–363. https://doi.org/10.47836/pjssh.32.2.01