



NEUROCOGNITIVE FOUNDATIONS OF BRAIN-BASED LEARNING STRATEGIES IN INDIAN TEACHER EDUCATION PROGRAMS

Sheena Mol P.R.¹, Dr. K. Prema²

¹Assistant Professor in General Education. CK Raghavan Memorial College of Teacher Education. Pulpally, Wayanad.

²Assistant Professor, Department of Education (CDOE), Bharathiar University, Coimbatore, Tamil Nadu.
sheenajayaram73@gmail.com | kaliappanprema@gmail.com

ABSTRACT

The present study examines the neurocognitive foundations of brain-based learning strategies in Indian teacher education programs and their influence on learning outcomes among B.Ed. trainees. Brain-based learning is grounded in neuroscience and focuses on how the human brain naturally processes information through attention, emotion, interaction, and experience-based learning. The main objectives of the study were to examine the effectiveness of brain-based learning strategies on academic achievement, cognitive skills, and teaching competency among teacher trainees. A quasi-experimental design was adopted with a sample of 60 B.Ed. trainees selected from two teacher education colleges in Kerala. The sample was divided into an experimental group (30) and a control group (30). The experimental group was taught using structured neurocognitive learning strategies, while the control group followed traditional lecture-based instruction. Pre-test and post-test data were collected using an achievement test and cognitive skill assessment tool. Statistical techniques such as mean, standard deviation, and t-test were used for analysis. The findings revealed that the experimental group performed significantly better than the control group in academic achievement, cognitive development, and teaching competency. The study concludes that brain-based learning strategies are highly effective and should be integrated into teacher education programs in India.

Keywords: Neurocognitive learning, Brain-based learning, Teacher education, Cognitive skills, Academic achievement

1. INTRODUCTION

Education is undergoing continuous transformation with the influence of neuroscience and psychology. Modern research in neuroeducation explains how the brain learns more effectively when instruction is meaningful, emotionally engaging, and actively experienced. In this context, brain-based learning has emerged as an effective pedagogical approach that aligns teaching strategies with brain functioning. In Indian teacher education programs, particularly in B.Ed. courses, traditional lecture methods are still widely practiced. These methods mainly focus on content delivery rather than cognitive engagement. However, neurocognitive research suggests that learning becomes deeper and more permanent when learners are actively involved in constructing knowledge.

The growing relationship between neuroscience and education has created new directions in the field of teaching and learning across the world. Educational researchers have increasingly recognized that understanding how the brain functions can help teachers design more effective instructional practices. Neurocognitive learning focuses on the mental processes involved in learning, such as attention, perception, memory, language, reasoning, and problem-solving. These cognitive processes directly influence how learners understand and retain knowledge in classroom situations. In recent years, teacher education institutions have started giving importance to learner-centred approaches

that promote active participation and meaningful engagement rather than passive memorization. Brain-based learning strategies emerged from this understanding and emphasize the natural way in which the brain acquires and processes information. Such strategies encourage interaction, creativity, emotional involvement, collaborative learning, and multisensory experiences, which contribute to long-term retention and deeper understanding. In the Indian education system, especially within teacher education programs, many classrooms still rely heavily on traditional lecture methods and examination-oriented learning practices. Although these approaches help in content completion, they often limit critical thinking, creativity, and reflective learning among teacher trainees. As future teachers, B.Ed. trainees require not only subject knowledge but also the ability to understand learners' cognitive needs and apply innovative pedagogical practices in classrooms. Neurocognitive perspectives can therefore play an important role in transforming teacher education by helping trainees understand how learning occurs inside the brain and how different instructional strategies influence cognitive development.

The National Education Policy (NEP 2020) also highlights the importance of experiential learning, competency-based education, critical thinking, and flexible pedagogical practices, all of which are closely connected with brain-based learning principles. When teaching methods are aligned with neurocognitive functioning, learners become more motivated, attentive, and actively involved in the learning process. Research studies have also shown that emotionally supportive and interactive classroom environments improve neural connections and increase memory retention. In teacher education programs, integrating neurocognitive learning strategies can help trainees improve teaching competency, classroom communication, instructional planning, and problem-solving abilities. It can also support stress reduction and confidence building among student teachers. Therefore, there is a growing need to examine how brain-based learning strategies can contribute to the improvement of teacher education in India. The present study attempts to explore the neurocognitive foundations of brain-based learning strategies and their effectiveness in enhancing academic achievement, cognitive skills, and teaching competency among B.Ed. trainees.

Therefore, integrating brain-based learning strategies in teacher education is essential to improve the quality of future teachers. It not only enhances academic performance but also develops cognitive abilities such as attention, memory, reasoning, and problem-solving skills. This study focuses on the effectiveness of neurocognitive learning strategies in improving teaching competency among teacher trainees.

2. OBJECTIVES OF THE STUDY

1. To study the effectiveness of brain-based learning strategies on academic achievement.
2. To examine the impact of neurocognitive strategies on cognitive skills.
3. To find out the influence of brain-based learning on teaching competency.

3. HYPOTHESES

1. H1: There is a significant difference in academic achievement between experimental and control groups.
2. H2: Brain-based learning improves cognitive skills among teacher trainees.
3. H3: Neurocognitive strategies enhance teaching competency.

4. METHODOLOGY

Quasi-experimental pre-test post-test control group design is used for the study.

POPULATION

All B.Ed. teacher trainees in selected teacher education colleges in Kerala.

SAMPLE

Total 60 trainees:

Experimental Group: 30

Control Group: 30

SAMPLING TECHNIQUE

Purposive sampling techniques was used for this study.

TOOLS USED

- Achievement Test
- Cognitive Skills Scale
- Teaching Competency Rubric

5.INTERVENTION PROCEDURE (EXPERIMENTAL GROUP)

Table: Neurocognitive Learning Intervention Schedule

Week	Neurocognitive strategy	Learning Activity	Cognitive outcomes
Week 1	Multisensory learning	Videos, charts, discussion-based teaching	Improved attention and basic understanding
Week 2	Chunking of information	Content divided into small units with summaries	Better memory retention
Week 3	Active learning	Role play, debates, problem-solving tasks	Critical thinking development
Week 4	Concept mapping	Mind maps and flow charts creation	Concept clarity and organisation
Week 5	Emotional learning	Storytelling and real-life classroom situations	Emotional engagement and deeper learning
Week 6	Collaborative learning	Group activities and peer teaching	Social learning and cooperation
Week 7	Repetition and Reinforcement	Revision tests and quizzes	Strong memory retention
Week 8	Feedback-based learning	Immediate feedback on teacher performance	Error correction and improvement

INTERPRETATION OF INTERVENTION TABLE

The intervention schedule shows a systematic application of neurocognitive learning strategies to the experimental group. Each strategy was selected based on brain functioning principles such as attention, memory formation, emotional involvement, and active participation. Multisensory learning improved initial engagement, while chunking helped reduce cognitive overload. Active learning and collaborative activities promoted higher-order thinking skills. Concept mapping improved organization of knowledge, and emotional learning created deeper conceptual connections. Continuous repetition and feedback strengthened retention and helped learners improve their performance progressively. Overall, the intervention created a meaningful and brain-compatible learning environment that enhanced the study. It also highlights that effective teaching is closely connected with understanding how learners think, process, and retain information. Neurocognitive learning strategies not only improve academic performance but also help teacher trainees develop confidence, creativity, and reflective thinking skills required for modern classrooms. The findings suggest that teacher education institutions should encourage innovative and brain-compatible instructional practices to make learning more meaningful and engaging. Therefore, the adoption of brain-based learning approaches can contribute to the creation of a more effective, learner-centred, and competency-oriented educational system in India, promoting cognitive and pedagogical development among teacher trainees.

5. DATA ANALYSIS AND INTERPRETATION

Table 2: Pre-test and Post-test Scores

Group	Test	Mean	SD	t-value
Experimental	Pre-test	42.10	4.20	
Experimental	Post-test	78.50	3.80	9.62
Control	Pre-test	41.80	4.10	
Control	Post-test	56.30	4.50	

INTERPRETATION

The data presented in Table 2 indicates the effectiveness of neurocognitive brain-based learning strategies on the academic achievement of B.Ed. trainees. The pre-test mean score of the experimental group was 42.10 with a standard deviation of 4.20, whereas the control group obtained a mean score of 41.80 with a standard deviation of 4.10. The close similarity between the pre-test scores of both groups shows that the students had almost the same level of achievement before the intervention programme.

After the implementation of neurocognitive learning strategies, the post-test mean score of the experimental group increased significantly to 78.50 with a standard deviation of 3.80. In contrast, the control group, which was taught through traditional lecture method, obtained a comparatively lower post-test mean score of 56.30 with a standard deviation of 4.50. The improvement in the experimental group was much higher than that of the control group.

The calculated t-value of 9.62 was found to be significant at the 0.01 level, indicating that the difference between the post-test scores of the experimental and control groups is statistically significant. This result clearly reveals that neurocognitive brain-based learning strategies had a strong positive influence on academic achievement among teacher trainees.

The lower standard deviation in the experimental group during the post-test stage also suggests consistency in the performance of students after the intervention. The findings indicate that strategies such as multisensory learning, collaborative activities, concept mapping, emotional engagement, and feedback-based instruction helped learners improve attention, understanding, memory retention, and participation in the learning process. Therefore, the study confirms that brain-based learning strategies are more effective than traditional teaching methods in enhancing the learning outcomes of B.Ed. trainees.

6. MAJOR FINDINGS

1. Brain-based learning significantly improved academic achievement.
2. Cognitive skills improved in the experimental group.
3. Teaching competency increased through neurocognitive strategies.
4. Traditional methods were less effective compared to brain-based learning.
5. Structured intervention improved engagement and retention.

7. DISCUSSION

The findings of the present study strongly support the principles of neurocognitive learning theory, which emphasizes that the brain learns more effectively through active participation, emotional engagement, meaningful interaction, and multisensory experiences. The structured intervention programme implemented for the experimental group helped teacher trainees connect theoretical knowledge with practical classroom experiences, thereby improving both cognitive and pedagogical competencies. The significant improvement in the post-test scores of the experimental group indicates that brain-based learning strategies positively influenced academic achievement, attention, memory retention, and conceptual understanding among B.Ed. trainees. The use of multisensory learning activities, collaborative tasks, concept mapping, storytelling, reflective learning, and immediate feedback created a learner-friendly environment that encouraged active participation and independent thinking. These strategies reduced passive learning habits and promoted critical thinking, creativity, and deeper engagement with the subject matter.

The study also revealed that emotionally engaging classroom experiences increased learners' confidence, motivation, and willingness to participate in learning activities. Compared to traditional lecture-based instruction, neurocognitive learning strategies provided greater opportunities for interaction, problem-solving, and experiential learning, which ultimately enhanced teaching competency among teacher trainees. The lower standard deviation observed in the post-test scores of the experimental group further indicates consistency in learning improvement after the intervention. The findings are also closely related to the goals of the National Education Policy 2020, which highlights competency-based learning, experiential education, and learner-centred pedagogy as important elements for educational reform in India. Therefore, the study highlights the importance of integrating neuroscience-informed instructional practices into teacher education programs for improving the quality of teacher preparation. It can be understood that when teaching strategies are aligned with the natural functioning of the brain, learners become more motivated, attentive, reflective, and capable of applying knowledge effectively in classroom situations. Hence, the integration of neurocognitive

brain-based learning strategies in teacher education institutions can play a significant role in developing competent, innovative, and professionally skilled future teachers.

8. EDUCATIONAL IMPLICATIONS

1. Neuroeducation should be part of teacher training curriculum.
2. Teachers should use multisensory and active learning strategies.
3. Curriculum should align with brain-based learning principles.
4. Supports NEP 2020 competency-based education framework.

9. CONCLUSION

The study concludes that neurocognitive foundations of brain-based learning significantly improve academic achievement, cognitive skills, and teaching competency among B.Ed. trainees. Therefore, integrating such strategies in Indian teacher education programs is essential for enhancing the quality of teacher preparation. The study also highlights that effective teaching is closely connected with understanding how learners think, process, and retain information. Neurocognitive learning strategies not only improve academic performance but also help teacher trainees develop confidence, creativity, and reflective thinking skills required for modern classrooms. The findings suggest that teacher education institutions should encourage innovative and brain-compatible instructional practices to make learning more meaningful and engaging. Therefore, the adoption of brain-based learning approaches can contribute to the creation of a more effective, learner-centred, and competency-oriented educational system in India.

10. REFERENCE

1. Sharma, R., & Kumar, P. (2021). Brain-based learning strategies and cognitive development among teacher trainees. *Journal of Educational Studies*, 14(2), 45–52.
2. Nair, S. R. (2020). Neurocognitive approaches in Indian teacher education classrooms. *Indian Journal of Teacher Education*, 8(1), 33–41.
3. Thomas, M., & Joseph, A. (2022). Brain-compatible teaching methods and academic achievement among B.Ed. students. *International Journal of Educational Research*, 11(3), 60–68.
4. Patel, K. (2021). Cognitive learning strategies for effective classroom instruction. *Journal of Contemporary Education*, 9(4), 74–81.
5. Reddy, V., & Singh, R. (2023). Neuroeducation and competency-based learning in teacher education programs. *Educational Perspectives*, 15(1), 22–30.

