

Educational Cognitive Science and Teacher Education

Bindhu. N. N¹, Dr. A. Jahitha Begum²

¹Assistant Professor, SNDP Yogam Training College, Adimali, Idukki, Kerala, India
(Research Scholar, Gandhigram Rural Institute - Deemed to be University, Gandhigram)

²Professor, Department of Education, Gandhigram Rural Institute - Deemed to be University, Gandhigram, Dindigul, Tamil Nadu, India

Abstract: *Educational cognitive science develops a deeper understanding of human cognition, how they learn, interpret, process information and generate knowledge. The present study intended i. To determine the effect of Educational Cognitive Science orientation. ii. To assess the knowledge of Educational Cognitive Science among prospective teachers. Experimental method with control and experimental group posttest design only adopted on a sample of 100 prospective teachers (experimental group 50 and control group 50). The prospective teacher's underwent Educational Cognitive Science orientation for 45 days. After orientation, Educational Cognitive Science Knowledge assessment tool used to assess their knowledge base. The findings revealed that Educational Cognitive Science orientation found effective in enhancing the knowledge of Educational Cognitive Science knowledge among the prospective teachers. The experimental group produced significant improvement in acquiring knowledge.*

Keywords: Educational Cognitive Science (ECS), Cognitive Science

1. Introduction

Cognition is the most fundamental process used to perceive, learn, think, understand, and interpret things around us. All the actions are centered on the amazing functions of our brain. Cognitive science connects human behavior from neural to social. Cognitive science studies helps to understand these concepts in depth (Weidman, J & Baker, K (2015). the present knowledge society demands the teachers those who excel both in theory and practice, support learner centered, authentic environments. Educational cognitive science shed light in this direction. The knowledge base of cognitive science enable teachers to change and use better learning practices that impact better outcomes (Clark Quinn, 2016).

What is Educational Cognitive Science?

Cognitive science is about cognition. It is an interdisciplinary scientific study of mental processes; embracing many disciplines - philosophies, anthropology, education, neuroscience, psychology, sociology and more. Studying the consequences of brains impact on learning is important today. (Thagard, 2009; Friedenber & Silverman, 2012). Training in cognitive science prepares students admirably well in their academics and career. Knowledge of cognitive science, provides clear idea about brain, its organization, structure and function, and its influence in the complex phenomena such as - memory, attention, thinking, reasoning, learning and consciousness.

Renovation in teacher education highly demands the creative, strategic, dynamic and technologically efficient teachers, who cater individual differences of the learners, tackles their needs, teach them to think critically, analyze logically, and train them to be creative in the assigned task; and active in work place. This urges the need for enhancing the quality of prospective teachers to meet out the current challenges. The knowledge of educational cognitive science provides deep insight to teachers about how brain influences learning, when designing lessons, selecting strategies, and creating learner friendly class environments.

Integrating cognitive science to educational practice offers sound theoretical knowledge about cognition, its theories and principles. McNamara, (2006) & Sousa, (2011) says that educational cognitive science is an application of cognitive theories, principles and testing theories in the classroom settings /real world settings.

2. Literature Survey

Lyons, C. A & Langui, M. L. (2001), suggested a basic course in cognitive neuroscience in the teacher education programme to prepare prospective teachers. The study highlights the application of cognitive neuroscience and learning styles will enable pre service teachers to identify, attend and assist individual learning needs of the learners. Sasikumar, Fathima & Mohan (2016) proved that the neurocognitive intervention strategies enhance the teaching competence of student teachers and recommends the introduction of theoretical base of Neurocognitive intervention strategies as a core subject in the B. Ed. curriculum to enhance the neurocognitive process of learners S. Cherrier, et al (2020), executed Neuroscience and Strategies in Education intervention program (Neurostrat E), based on the brain knowledge, on academic achievement self - knowledge and autonomy of high school students through a metacognitive approach. The study demonstrated greater student's autonomy and better self - knowledge. Ramganesh. E & Hariharan. C, (2020) examined the awareness of neurocognition among the college teachers and recommends neurocognition based education. The above reviews motivated to experiment the role of educational cognitive science in the preparation of prospective teachers.

3. Statement of the Problem

Integrating cognitive science in teacher education may help to prepare prospective teachers to diagnose and attend individuals learning needs effectively. Understanding one's own learning preferences improves teaching style. Teachers who are aware about their own learning/teaching style can

easily understand others. Knowledge base of educational cognitive science in teacher education would provide a strong foundation for prospective teachers in developing an expertise in teaching and learning process. In order to experiment the above - mentioned facts, the researcher has attempted to study the influence of ECS in enhancing the knowledge of Educational cognitive science among the prospective teachers through Educational Cognitive Science orientation.

Objectives of the study

- To determine the effect of Educational Cognitive science orientation among the prospective teachers
- To assess the knowledge of Educational Cognitive science knowledge between the experimental and control group prospective teachers.
- To assess the knowledge of Educational Cognitive science knowledge between the experimental and control group prospective teachers with respect to subjects such as English, Malayalam, Mathematics, Natural science, Physical Science and Social Science.

Hypotheses of the study

- There is no significant difference in the knowledge of Educational Cognitive science knowledge between experimental and control group prospective teachers.
- There is no significant difference in the knowledge of Educational Cognitive science knowledge between experimental and control group prospective teachers with respect to subjects such as English, Malayalam, Mathematics, Natural Science, Physical Science and Social Science.

Methods

Experimental method with control and Experimental group posttest design adopted. The experimental group chosen for the present study consists of 50 B. Ed teacher trainees (n=50) enrolled in the first year (2019 - 21) from SNDP Yogam Training College, Adimali, Idukki district. The control group consists of 50 B. Ed teacher trainees (n=50) enrolled in the first year (2019 - 21) from SreeNarayana College of Teacher Education, Muvattupua, Ernakulam district. They were assigned by using simple random sampling technique. The Experimental and Control groups were equivalent with respect to their educational qualification, gender, age, management and time of presence in colleges.

Tools Used

The following tools were used for the study;

- Educational Cognitive Science Module (ECS)
- Educational Cognitive Science Knowledge Assessment Test (ECSKAT)

The experimental group underwent 'Educational cognitive science orientation' for 45 days. No treatment given for control group. After orientation, administered ECSKAS for both experimental and control group.

4. Result / Discussion

Table 1: Independent Sample 't' test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science knowledge of posttest among the prospective teachers

Group	Post - test Knowledge of ECS			't' Value	Significance Level
	N	Mean	SD		
Experimental Group	50	32.38	4.59	14.36	Significance at 0.05 Level
Control Group	50	19.88	4.08		

Independent Sample 't' test results indicate that there is significant difference between the Experimental M = 30.38, SD = 4.59) and Control Group (M = 19.88, SD = 4.08). The calculated t value 14.36 is greater than the table value, which is significance at 0.05 Level. Hence, the null hypothesis is rejected. It indicates that he ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS among the prospective teachers.

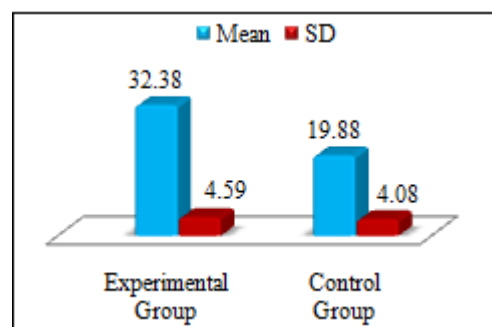


Figure 1: Comparison of test scores between Experimental and Control Group towards the knowledge of ECS Knowledge

Table 2: Independent Sample 't' test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science Knowledge of post - test among the prospective teachers of English Subject

Group	Post - test Knowledge of ECS			't' Value	Significant Level
	N	Mean	SD		
Experimental Group	13	30.5	4.31	9.06	Significance at 0.05 Level
Control Group	12	17	2.96		

Independent Sample 't' test results indicate that there is significant difference between the Experimental M = 30.5, SD = 4.31) and Control Group (M = 17, SD = 2.96). The calculated t value 9.06 is greater than the table value, which is Significance at 0.05 Level. Hence, the null hypothesis is rejected. It indicates that he ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS among the prospective teachers of English Subject.

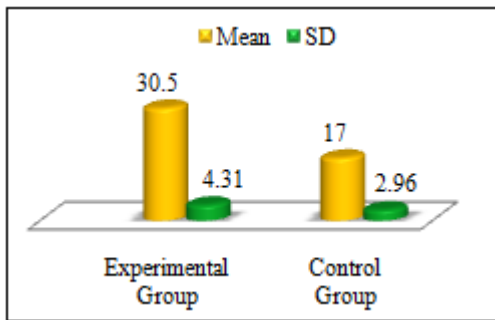


Figure 2: Comparison of test scores between Experimental and Control Group of English Option towards the knowledge of ECS

Table 3: Independent Sample ‘t’ test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science Knowledge of post - test among the prospective teachers of Malayalam Subject

Group	Post - test Knowledge of ECS			‘t’ Value	Significant Level
	N	Mean	SD		
Experimental Group	4	29.25	3.49	6.29	Significance at 0.05 Level
Control Group	7	17.43	1.82		

Independent Sample ‘t’ test results indicate that there is significant difference between the Experimental M = 29.25, SD = 3.49) and Control Group (M = 17.43, SD = 1.82). The calculated t value 6.29 is greater than the table value, which is Significance at 0.05 Level. Hence, the null hypothesis is rejected. It indicates that he ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS among the prospective teachers of Malayalam Subject.

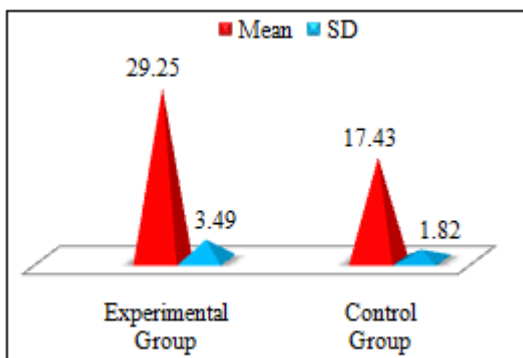


Figure 3: Comparison of test scores between Experimental and Control Group of Malayalam Option towards the knowledge of ECS

Table 4: Independent Sample ‘t’ test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science Knowledge of post - test among the prospective teachers of Mathematics subject

Group	Post - test Knowledge of ECS			‘t’ Value	Significant Level
	N	Mean	SD		
Experimental Group	10	32.3	4.27	5.75	Significance at 0.05 Level
Control Group	7	21.71	3.33		

Independent Sample ‘t’ test results indicate that there is significant difference between the Experimental M = 32.3,

SD = 4.27) and Control Group (M = 21.71, SD = 3.33). The calculated t value 5.75 is greater than the table value, which is Significance at 0.05 Level. Hence, the null hypothesis is rejected. It indicates that he ECS orientation given to the experimental group was found effective in promoting increasing the knowledge of ECS knowledge among the prospective teachers of Mathematic Subject.

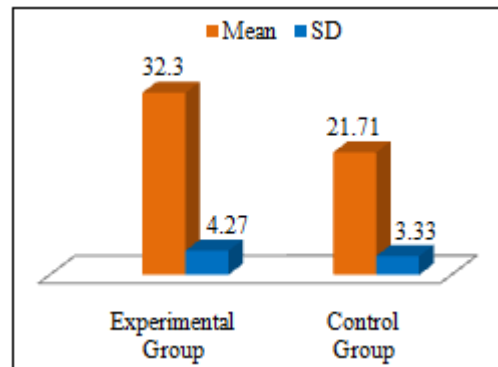


Figure 4: Comparison of test scores between Experimental and Control Group of Mathematics Subject towards the knowledge of ECS

Table 5: Independent Sample ‘t’ test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science knowledge of post - test among the prospective teachers on Natural Science Subject

Group	Post - test Knowledge of ECS			‘t’ Value	Significant Level
	N	Mean	SD		
Experimental Group	6	33.17	4.23	4.25	Significance at 0.05Level
Control Group	8	24	3.67		

Independent Sample ‘t’ test results indicate that there is significant difference between the Experimental M = 33.17, SD = 4.23) and Control Group (M = 24, SD = 3.67). The calculated t value 4.25 is greater than the table value, which is Significance at 0.05 Level. Hence, the null hypothesis is rejected. It indicates that he ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS knowledge among the prospective teachers of Natural Science subject.

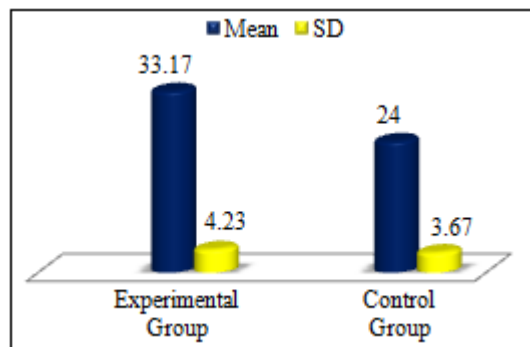


Figure 5: Comparison of test scores between Experimental and Control Group of Natural Science Option towards the knowledge of ECS

Table 6: Independent Sample ‘t’ test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science of post - test among the prospective teachers of Physical Science Option

Group	Post - test Knowledge of ECS			‘t’ Value	Significant Level
	N	Mean	SD		
Experimental Group	15	35	3.83	6.5	Significance at 0.05 Level
Control Group	7	22.29	4.18		

Independent Sample ‘t’ test results indicate that there is significant difference between the Experimental M = 35, SD = 3.83 and Control Group (M = 22.29, SD = 4.18). The calculated t value 6.5 is greater than the table value, which is significance at 0.05 level. Hence, the null hypothesis is rejected. It indicates that the ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS knowledge among the prospective teachers of Physical Science Subject.

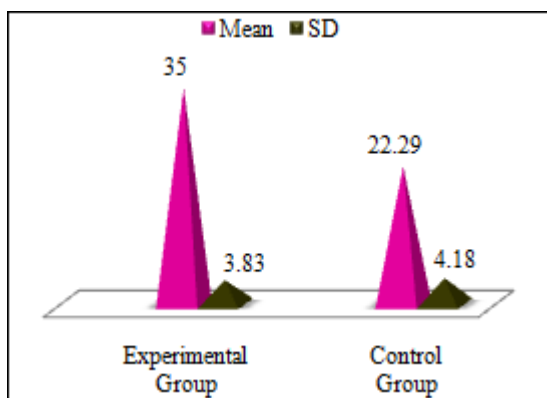


Figure 6: Comparison of test scores between Experimental and Control Group of Physical Science subject towards the knowledge of ECS

Table 7: Independent Sample ‘t’ test for significant difference between Control and Experimental Group towards the knowledge of Educational Cognitive Science knowledge of post - test among the prospective teachers of Social Science subject

Group	Post - test Knowledge of ECS			‘t’ Value	Significant Level
	N	Mean	SD		
Experimental Group	3	29.67	4.47	4.06	Significance at 0.05 Level
Control Group	8	18.88	1.85		

Independent Sample ‘t’ test results indicate that there is significant difference between the Experimental M = 29.67, SD = 4.47 and Control Group (M = 18.88, SD = 1.85). The calculated t value 4.06 is greater than the table value, which is significance at 0.05 level. Hence, the null hypothesis is rejected. It indicates that the ECS orientation given to the experimental group was found effective in increasing the knowledge of ECS knowledge among the prospective teachers of Social Science Subject.

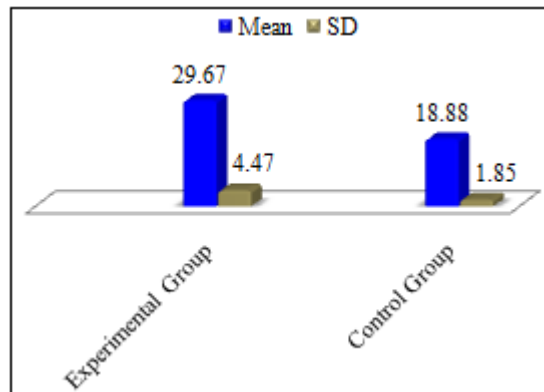


Figure 7: Comparison of test scores between Experimental and Control Group of Physical Science subject towards the knowledge of ECS Knowledge

The experimental group who received Educational Cognitive Science (ECS) orientation performed well than those who have not received ECS. The prospective teachers improved their Knowledge on ECS with the help of ECS intervention. Educational Cognitive Science orientation given to them was found effective in enhancing their knowledge on ECS knowledge among the prospective teachers than those have not received ECS orientation.

5. Conclusion

Teacher education is intended to prepare and produce efficient, effective and competent teachers. The competency in teaching is efficiency in application of cognitive strategies. Understanding learner is very important aspect of teaching. The knowledge of educational cognitive science would encourage them to handle learners in new perspective. It will help them to recognize the bases of individual differences of learners, teaches how to cater their emotions and encourages experimenting innovative techniques in the classrooms, provides ways to create joyful learning environments. The present study proved that the Educational Cognitive Science orientation found effective in transacting concepts related to the knowledge of cognition, its neural basis of learning. The ECS orientation helped prospective teachers to improve their Knowledge on Educational Cognitive Science Knowledge than those who have not received the intervention. This emphasizes the need for integrating Educational Cognitive Science in the B. Ed curriculum.

6. Future Scope

This recommends the need to popularize educational cognitive science by introducing it as a major subject in the teacher education. Orientation programmes should be organized at all levels of teacher education to understand and appreciate the impact of educational cognitive science in the teaching and learning. The teachers must be empowered once again to design curricula and pedagogies (Johnson and Hallgarten, 2002).

7. Acknowledgement

This paper is an output of original work and would not have been possible without the support of my research

supervisor, Dr. A Jahittha Begum. Her immense knowledge in the subject and guidance have been an inspiration and kept my work on the track.

References

- [1] Brown, D. (2007). Cognitive Science Concepts and Technology Teacher Education.
- [2] Brain waves –Module 2 (2011). Neuroscience: implications for education and lifelong learning The Royal Society.
- [3] Esteves, Manuela (2008) Towards the Pedagogical Excellence of higher Education. Sisfo. Educational Sciences Journal, 07, pp.99 - 106.
- [4] Geake, J & Cooper. P (2003) Cognitive Neuroscience: Implications for Education. Westminster Studies in Education, Vol 26, N0.1
- [5] Learning landscapes (2011). Mind, Brain and Education: implications for Education.5 (1).
- [6] Lyons, A. C. &Languis. L. M. (2001) Cognitive Science and Teacher Education.
- [7] McNamara., D. S, (2006) Bringing Cognitive Science into Education, and Back Again: The Value of Interdisciplinary Research. Cognitive Science 30, 605–608
- [8] McBride, H. E. A., & Pomeroy, M. (2009). From theory to practice: Introducing neuroscience in to a teacher education programme.
- [9] Talkhabi M. (2012) Foundations of cognitive education: Issues and opportunities. Procedia - Social and Behavioral Sciences 32 (2012) 385 – 390.
- [10] Weidman J, Baker K. (2015) The Cognitive Science of Learning: Concepts and Strategies for the Educator and Learner. Anesth Analg. 121 (6): 1586 - 99. doi: 10.1213/ANE.0000000000000890.
- [11] Shodhganga. Infilibnet. ac. in
- [12] www.researchgate. net