

Effectiveness Of Teaching Mathematics Using 5e Instructional Model Among Standard IX Students

Dr.T.Komalavalli
Assistant Professor,
School of Education, VISTAS
Pallavaram, Chennai.
E-mail id: komalaravi12@gmail.com

ABSTRACT

This study aimed to investigate the effectiveness of using 5E Instructional Model on achievement in Mathematics among ninth standard students. To achieve the objectives of the study and answering the research questions, the researcher used the semi-experimental method. Experimental group consisted of 32 students and control group comprised of 28 students. 't' test is used to find out the significant difference between two groups. Experimental group was taught with constructivist approach of using the 5E's instructional model. It is observed that both the groups were equal in their pre-test Mathematics achievement scores before the experiment. But, in the post-test, they differed in their achievement scores proving the effectiveness of 5E instructional model. The study also concluded that there is no difference between girls and boys in the post-test Mathematics achievement scores.

Keywords: 5E's, Instructional Model, Mathematics Achievement, Gender.

INTRODUCTION

The constructivist theory is one of the contemporary learning theories that emerged from knowledge theories, in which underlying its philosophical basis that the role of the teacher is crucial and he/she should be a philosopher, guide, leader and facilitator of learning processes and create an educational environment for the students to build his knowledge by himself through direct interaction with the students and the use all his skills and previous experiences to be the center of the educational process (Zayton, 2007). The constructivist approach and the studies carried out in parallel to it, focused on how to secure the permanence of the knowledge rather than obtaining it and how derive new information from the acquired knowledge (Shiland, 1999).

Constructivism was defined by Afaneh and Abu Mallouh (2006) as "a process of interaction between three elements in the educational attitude: past experiences, educational attitude presented to the learner, and environmental climate in which the learning process takes place, to build and develop new knowledge structures, characterized by inclusiveness comparing to the previous knowledge, and using these new cognitive structures in addressing new environmental attitudes." The constructivist theory constructed on learning rather than teaching, dealing with learners as creative student and encouraging them to independence, initiative, research, investigation, and discussion, as it emphasizes the curiosity to learning, creative thinking in order to build a new knowledge, and change the teacher's role to be interactive teacher, organizing the learning environment, while the role of the learner is characterized by activity and positive innovation and try to discover knowledge, self-understanding through discussion with others and keep away from memorization (Abu Safar, 2014).

The (5E's) instructional model is one of these constructivist models, and was developed by Rodger W Bybee in 1997 which consists of five stages: engage, explore, explain, elaborate, and evaluate, and each phase has a specific function and contributes to the teacher's coherent instruction and to the learners' formulation of a better understanding of scientific and technological knowledge (Dahmash, Naaman and Lafras, 2014; Bybee, 2006).

PHASES OF 5E MODEL

An explanation of each phase of the 5E model follows:

Engage: Capture the learners' attention, stimulate their thinking, and help them access prior knowledge. For this, the teacher has to create a situation to arouse curiosity among learners.

Explore: Give time to learners to plan, investigate and collect information and to think and reflect on the data to organize it, to make preliminary meaning. For this, teachers have to facilitate learners with various activities such as group work, discussion etc.

Explain: Encourage and involve learners in group work to share and analyze the data they gathered.

Elaborate: Provide learners with an opportunity to extend and codify their understanding of the concept and apply it to real world situation. Learners are to be encouraged and enhance the new concept. Teachers have to facilitate and guide learners in expanding their understanding and developing creative abilities as well as reflective and critical thinking.

Evaluate: Evaluation of learners' conceptual understanding and ability to use skills begins at the stage of engage and continues throughout the model.

PREVIOUS STUDIES

Ali Alshehri (2016) examined the impact of using 5E instructional model on achievement of Mathematics and retention of learning among fifth grade students and found that after experiment both were different in their achievement test scores in favor of experiment group. It is concluded that this significant performance of experiment group may be due to teaching them with the (5E's) instructional model. The study also concluded that there were no statistically significant differences in the experimental group attributed to the post and postponed test (three weeks after) which shows retention of learning among experimental students.

Uzma Siddiqui (2016) investigated the effects of teaching one of the most fundamental concepts of Chemistry 'Solutions' using Traditional Instruction (TI) and 5E Instructional Model of Constructivist Approach (IMCA) on students' achievement in Chemistry. A total of 60 ninth-grade students participated in this pretest-posttest control group quasi-experimental study. Control Group (n = 30) was taught by TI, whereas the two Experimental Groups EG (n = 30) was subjected to IMCA. An analysis of covariance on Chemistry achievement posttest scores with students' pretest scores as the covariate showed that IMCA was more effective in enhancing the students' achievement in Chemistry than TI.

Abu Atta (2013) studied the effect of employing learning cycle model in the development of creative thinking skills in Mathematics at ninth grade students in Gaza, Palestine. The study implemented a pilot study on a sample of 28 students studied using the learning cycle strategy, and another control group composed of 26 students taught using the traditional method, and the results of the study showed a significant difference between the two groups in favor of experimental group.

PROBLEM OF THE STUDY

Mathematics plays a crucial role in our daily life and hence it is considered as an important subject in schools. But, it is still considered to be a difficult subject for many students to learn, and that might be due to many teachers still using the traditional methods in teaching mathematics in which that leads to poor achievement. Teachers has to teach the subject interestingly so as to enhance interest towards learning Mathematics among the students. New innovative techniques have to be implemented in teaching strategies to raise motivation, curiosity, discovery and development of thinking skills. Hence, the problem of this study appeared to explore the effectiveness of teaching Mathematics using 5E instructional model among IX standard students.

Therefore, the following research questions were framed for this study.

1. What is the impact of using the (5E's) instructional model on achievement in Mathematics among standard IX students?
2. Is there any significant difference between boys and girls in Mathematics through 5E instructional model?

METHODOLOGY

This is a semi-experimental study, and was designed to explore the impact of using (5E's) instructional model in the teaching of Mathematics at ninth standard students through controlled pre-test and post-test to see the impact of the model. The study was delimited to a random sample of 60 students studying ninth standard in Government Higher Secondary School in Chennai. Experimental group consisted of 32 students and control group comprised of 28 students. 4

TOOL OF THE STUDY:

The investigator prepared a lesson plan using 5E instructional model for the topic "Polynomials" to teach ninth standard students. Achievement test was constructed by the investigator on the same topic. Pre-test and post-test was conducted to the students in order to find out the effectiveness of 5E Instructional model lesson plan. The 5E model lesson plan and tests were presented to a group of experts in the field of teaching mathematics in order to

determine the validity of the tools; the percentage of agreement among experts on the validity of the tests was (82%), and modifications were carried out according to their opinions.

RESULTS AND DISCUSSION

Research question 1:What is the impact of using the (5E's) instructional model on achievement in Mathematics among standard IX students?

To ensure the homogeneity of the groups before teaching, t-test have been performed to demonstrate the significance of differences between control and experimental groups before starting the application of 5E instructional model which has been presented in the following table.

Table 1

Mean differences of Achievement Pre-test Scores for the experimental and control groups before starting the 5E instructional model of teaching

Group	N	Mean	Standard Deviation	t value	Level of Significance
Control	28	6.582	1.472	0.092	NS
Experimental	32	6.294	2.214		

NS - Not significant

From the 't' value presented in the above table, it is evident that there is no significant difference between the control group and experimental group in the pre-test scores and it is concluded that the groups were equal and homogeneous.

To explore the effectiveness of using (5E's) instructional model in development of students' understanding and achievement of ninth standard students in the unit 'polynomials', mean and standard deviation between the control and experimental groups after the implementation of 5E Instructional strategy on experimental group was presented in the following table.

Table 2

Mean differences of Achievement Post-test Scores for the experimental and control groups after implementation of 5E Instructional strategy on experimental group

Group	N	Mean	Standard Deviation	t value	Level of Significance
Control	28	7.371	2.346	6.845	0.01**
Experimental	32	11.594	1.987		

** Significant at 0.01 level

From the 't' value presented in the above table, it is inferred that there exists significant difference between control group and experimental group in the post-test scores at 0.01 level. Hence, it is concluded that there are significant differences between the control and experimental groups in favour of the experimental group in post-test scores which indicates the effectiveness of the use of 5E instructional model in development of students' achievement of ninth standard students in the unit of polynomials.

Research Question 2: Is there any significant difference between boys and girls in Mathematics through 5E instructional model?

Table 3

Mean differences between boys and girls of experimental group in Achievement Post-test Scores

	N	Mean	Standard Deviation	t value	Level of Significance
Boys	14	5.875	2.981	0.054	NS
Girls	18	6.251	3.321		

** Significant at 0.01 level

From the 't' value presented in the above table, it is observed that there is no significant difference between boys and girls in the Achievement post-test scores of experimental group. Hence, it is concluded that both boys and girls are similar in their achievement after implementing the 5E Instructional strategy in Mathematics.

CONCLUSION AND RECOMMENDATION

From the findings, it is proved that teaching Mathematics using 5E instructional model lesson plan is very effective when compared to conventional method of teaching. Also, constructivist teaching method in Mathematics has been proved through various researches to be comparatively far better than that of the traditional teaching method. It is evident that the students of experimental group not only learnt and achieve better but also understand the concepts very well using this 5E approach. Hence, the study would recommend the following:

- The present study suggests that modern and practical instructional techniques using constructivist approaches would enhance learning Mathematics in a better way and improve the students' understanding of the mathematical concepts.
- Appropriate training for teachers to use (5E's) instructional model to teach Mathematics would enhance students' active participation in the learning process effectively.
- Every Mathematics teacher has to prepare a 5E approach lesson plan before entering into the class so as to teach the concepts clearly and make the students grasp the contents better so as to ensure better understanding among the students.

REFERENCES

Abu Atta, A., (2013). The impact of the employment of learning cycle in the teaching of mathematics for the development of creative thinking skills at ninth-grade students in Gaza Governorates, Unpublished Master Thesis, College of Education, Al-Azhar University in Gaza.

Ali Alshehri, M. (2016). The Impact of Using (5e's) Instructional Model on Achievement of Mathematics and Retention of Learning among Fifth Grade Students. *IOSR Journal of Research & Method in Education*, 6(2), 43-48.

Uzma Siddiqui (2016). Effectiveness of 5E Instructional Model of Constructivist Approach on Ninth-Grade Students' Conceptual Understanding of Solutions. *Paripex – Indian Journal of Research*, 5(3), 175-178.

Abo-ssfr, Fatima Abdul Latif (2014). The impact of the employment of two strategies; Quintet learning cycle (5E's) and self-table in mathematical problem solving at eighth-grade students in Gaza Governorates. College of Education: Al-Azhar University in Gaza, Unpublished Master Thesis.

Zaitoun, Ayesh Mahmoud (2007). Constructivist theory and strategies for teaching Science. Oman: Sunrise House for publication and distribution.

Afaneh, Izzo & Abu Mallouh, Mohammed (2006). The effect of using some constructivist theory strategies in the development of systemic thinking in geometry at ninth-grade students in Gaza. Proceedings of the First Scientific Conference of the Faculty of Education, the Palestinian experience. Vol.1, No. 24.

Shiland T.W. (1999). Constructivism: The Implications for Laboratory Work. J. Chem. Educ., 76(1): 107-109.

Dahmash, Abdul Wali & Noman, Abdel Kawi & Lafras, Thekra (2014). The effect of using Bybee model to adjust the alternative scientific conceptions for students at eighth grade. *Arab Journal of Scientific and Technical Education*. 54(2).