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A Study on the Effect of 7E-Constructivist Approach on the Achievement in Physical Science of IX Standard Students

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Abstract:-

In India National Curriculum Framework (NCF 2005) confirmed the direction of Indian classroom situation and also constructivism is an emerging pedagogy among teaching community across the world. Constructivism emphasizes on knowledge construction rather than knowledge received by the learner which is unique to individual. This is pretest - posttest quasi experimental design incorporating both qualitative and quantitative technique. 7E learning strategy has been applied to experimental group and traditional method of teaching applied to control group where 60 students participated. The science achievement test (SAT) was used to estimate the students achievement in both the groups.

Keywords: Constructivism, Science Achievement Test, Science Achievement test.

Introduction:

Society is being revolutionize through the exponential expanding of scientific knowledge. Scientific revolution can be seen every aspects of our lives from discoveries of atomic sciences, to discovery of new vaccines in modern sciences with the help of technological advancements in the field of communication. Science has touches every aspects of human touched, which is actually back bone of human existence. According to NCERT (2006) the inquiring human mind or imaginative human sense responded so many ways by observing the physical and biological world closely. Science is not only confined to just absorbing the evidence but it is something far to go beyond than this. Today's science education scenario should aim at analyzing the nature of science. Reflecting the nature of science is also a obligate ingredients for feeling of a human being.

Constructivism:

Working group of NCERT (2008) and NCF (2005) apparently highlighted the significance of Constructivist strategy as a teaching approach for reflecting the nature of scientific phenomenon. *Constructivism: The New Paradigm from Theory to Practice*. (Mahapatra, M., and Parida, B. K., 2015). In science education constructivism is used as a greater pedagogical approach. Actually constructivism brings about paradigm shift from teaching to learning, emphasizes on knowledge construction rather than knowledge received. Constructivist 7E-strategy surely act as a catalyst for the learners to analyze the nature of science and also they can able to construct their own knowledge that acts as strong background for learning new knowledge with the help of experimentation and reflecting on those previous experiences. According to Oh and Yager (2004) the constructivist 7E learning environment is considered emergent in the classroom. Constructivist 7E strategy also helps to science educators to enhance student's engagement in the real classroom.

Objectives:

1. To study the effectiveness of Constructivist Approach on the student's achievement in Physical Science in class- ix standard.
2. To study the effectiveness of constructivist approach on the student's achievement with respect to their gender.

Hypothesis:

1. The constructivist approach has a positive effect on achievement of class IX standard students in physical science.
2. There is a significant difference between boys and girls achievement in physical science due to constructivist approach in teaching physical science.

Design of the Study:

The experimental design of the study was non- equivalent pre-test and post-test design. Class- ix standard was selected for experimental purpose.

Sample: In this study researchers adopted the purposive sampling method. A government higher secondary school which is WBBSE affiliated was purposively selected for conducting the experiment of the study. Section –A of class IX was taken as the experimental group and section –B was taken as the control group selected randomly.

Development of instructional materials:

For learning facilitation the researchers developed different instructional materials, in this present study two types of instructional tools were used. Traditional method of teaching (TMT) followed for control group and the constructivist approach followed for experimental group by the investigator. Limited instructional strategies for traditional teaching to the control group, where teacher emphasized on content recitation without allowing time for the learners to reflect upon the materials presented or apply it to real life situations. 'Yager' has described experimental teaching based on constructivist learning, Bybee(1993) developed '5E' i.e. engage, explore, elaborate, evaluate model. This model was applied by Loud (2001). Both the groups were taught by the researcher to avoid teacher variable.

Phase 2: Implementation phase:-

For the study experimental group and control group were selected based on marks obtained by the last summative evaluation of those students. Pretest, achievement test were administered by the researchers on both the groups. Then experimental group were taught through 5E (constructivist approach) and control group were taught through traditional teaching strategy approach.

Administration of tools:-

For analyzing an interpretation of the collected data the researcher used statistical technique like mean, SD, t-test etc.

Measuring tool:-

Science achievement test (SAT) was developed by the investigator for the study and it was validated by some science experts and educator evaluators. Item test consisted 35 items including objectives and subjective items from third chapters atoms and molecule of class IX standards

(according to latest secondary education syllabus) by using test retest formula reliability coefficient of SAT was calculated and co-efficient of internal consistency for SAT was 0.18 which value is highly reliable. The experimental group participated in constructivist learning environment and control group participated in the common traditional instructional strategy during the overall treatment process. To implementation of 80 periods of both experimental and control groups was given as treatment until completion of the chapter. After the completion of the Treatment process post-test achievement test was conducted for both the experimental and control groups.

Analysis and Interpretation of data:

To determine the effect of Constructivist 7E- strategy, the collected data were analyzed taking in consideration the overall achievements scores of the learners as different dimensions (knowledge, understanding, application, evaluation and skill) of Science Achievement Test. The gender difference in Science achievement was also analyzed with the help of post score of achievement test.

Table-1: Comparison of Achievement Score in Pre-test of Control group and Experimental group.

Table-1 indicates that the means of science score in science of the control group and experimental group were 44.2 and 46.2 respectively. It is also indicated that the obtained t- value (1.85) at 0.05 level of significance. So it can be concluded that there is no significant difference between pre-test of control group and experimental group. This significance value also supports that there is no difference between two groups before treatment. Hence it can be concluded that students' achievement in both experimental and control group is similar before treatment.

Groups	Mean	Sd	Df	t-value	Significance level
Control group (N=30)	44.2	3.36	58	1.86	Not significant
Experimental group (N=30)	46.2	4.2			

Table-2: Comparison of Achievement Score of Experimental group in Pre-test and post-test

From table-2 it has been found that the mean value of pre-test and post-test are 46.1 and 58.9 respectively. The mean difference between two mean post-test and pre-test is 12.7 with SD values are 3.36 and 5.21 respectively. Its calculated t-value is 12.08 which is significant at 0.01 levels.

This significance value also supports that there is difference between pre-test and post-test and pre-test achievement score of experimental group. Hence it can be concluded that there is difference between pre-test and post-test achievement scores, these difference arises due to treatment by constructivist 7E- strategy.

Table-3 Comparison of Achievement Score in Post-test of Control group and Experimental group

Science Achievement test (SAT)	Test	Mean	Mean diff	Sd	t-value	Significance level
	Pre-test (N=30)	46.2	12.7	3.36	12.08	Not significant
	Post-test (N=30)	58.9		5.21		

Science Achievement test (SAT)	Test	Mean	Sd	t-value	Significance level
	Control group (N=30)	44.4	2.69	6.43	Not significant
	Experimental group (N=30)	51.6	5.43		

From table-3 it has been found that the mean value of pre-test and post-test are 46.1 and 58.9 respectively. The mean difference between two mean post-test and pre-test is 12.7 with SD values are 3.36 and 5.21 respectively. Its calculated t-value is 12.08 which is significant at 0.01 levels.

This significance value also supports that there is difference between pre-test and post-test and pre-test achievement score of experimental group. Hence it can be concluded that there is difference between pre-test and post-test achievement scores, these difference arises due to treatment by constructivist 7E- strategy.

Finally from the above three table it can be concluded that Hypthesis-1 'The constructivist approach has a positive effect on achievement of class IX standard students in physical science' is accepted.

Table-4 Comparison of Achievement mean scores between Boys and Males.

Sex	N	Mean	MD	Sd	t-value	Significance level
Boys	32	30.4	1.10	2.8	1.88	Not significant
Girls	28	29.3		1.9		

From the table-4 mean value of Boys and Girls a non-significance difference was observed, the calculated t-value was found to be non-significant at .01 level. Mean difference between Boys and Girls is 1.10 with SD values were 2.8 and 1.9 respectively. Hence it can be concluded that there is no significant difference between boys and girls achievement in science as an effect of Constructivist 7E strategy. Finally it can be concluded that Hypothesis-2 'There is a significant difference between boys and girls achievement in physical science due to constructivist approach in teaching physical science' is accepted.

Major Findings of the study:

a) Constructivist approach has a significant effect on the achievement of science students. It is evident from the analysis that achievement score is higher rather than other methods of teaching.
b) For the efficiency in science constructivist approach is equally effective for the students.
c) Constructivist approach enhances understanding application abilities effectively with respect to another method.

Discussion:

These findings is supported by the findings of so many other studies. Jong Su Kum

(2005) studied that using constructivist teaching methods of 6th grade scode in better achievement than conventional method. Sasikala and Ramchandran (2006) used child driven learning environment for teaching computer programming and it was found to be more significant than conventional classroom teaching

There are some possible reasons behind such findings may be following ----

(1) Children were given freedom and also democratic conditions to think beyond reflection level to discover the unknown. There were no boundaries that could limit a curious learner right to question.

Conclusions:

Studies have proved that the conventional orthodox system is insufficient to inculcate to critical reflective thinking and defensive attitude amongst the present day students. So, this is the best time to reform our teaching learning process. Through this model the teacher expresses the students the grounding knowledge by interactive question answer participation approach and also gives them a chance to be associated with other discipline at the end of the process and transfer it to other subjects. The teacher must find out the misconceptions, the plan of the teaching process of the discipline by expressing the prior knowledge of the students. The teacher should also clear the misconceptions because misconceptions personally hinders meaningful learning. For these reasons the teacher should organize the teaching process to strengthen the background knowledge of the students by determining the probable misconceptions of the learners. In accordance with the finding of the present study it can be concluded that 7E model can be applied to express the background knowledge of the learners and to evaluate their learning.

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