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Impact of 7E model of Constructivist teaching approach on the academic achievement of IX standard English Medium Science students.

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Abstract: *This study aims to examine the impact on student's academic achievement in Physics taught by the training module on the 7E model of the Constructivist approach (Experimental group) and the traditional teaching method (control group) of the standard IX students studying in secondary school English Medium affiliated to ICSE Board in Mumbai region. In this study, the tool made by the researcher has been used to collect primary data from the standard IX students studying in secondary school English Medium affiliated to ICSE Board in Mumbai region. A sample of 153 students was drawn from 2 ICSE schools in the study area. Data were analyzed using descriptive and inferential statistics. The study found Results from the study showed that the mean score of the experimental group was higher than the mean score of the control group. The study also revealed that there was a statistically significant difference between the mean scores of those exposed to 7E's constructivist approach and those exposed to the traditional method.*

Keywords: *Academic Achievement, Secondary School Students, 7E-Model of constructivism, Traditional method.*

1. INTRODUCTION:

"**Tell me & I forget, teach me & I remember, involve me & I learn.**"
- Benjamin Franklin.

Constructivism is a term that has recently become popular among scientific educators. It is increasingly being used as a theoretical justification for research and education. Many current reform efforts are also related to constructivism. Constructivism is founded on the premise that learners actively construct or create their knowledge, based on prior knowledge.

The present study investigated the Impact of 7E's instructional approach on the academic achievement of secondary school science students studying physics over the traditional method in English Medium schools affiliated with the ICSE Board in the Mumbai region. A pre-test, post-test, and non-equivalent control group involving a true-experimental design was used. The study was conducted with 153 students drawn from 2 ICSE schools in the study area. In each school, two intact Physics classes were selected and randomly assigned experimental and control groups. The experimental group was taught a few topics from Grade 9 Physics using 7E's instructional approach, while the control group was taught using the traditional method. Achievement tests based on the topic were used for data collection. The result revealed among others that there was a statistically significant improvement in student achievement in 4 topics of Physics after exposure to 7E's instructional approach than those exposed to the traditional method. The content validities of the instrument were carried out by three experts in Physics. Equivalent form and test-retest methods of reliability were employed. A reliability coefficient of equivalence of the tool, Cronbach's Alpha,$\alpha = .860$. Item analysis was done to determine the psychometric features of each test item. The research question was answered using descriptive statistics of mean and the corresponding null hypothesis was tested using inferential statistics of t-test at $p \leq 0.05$ level of significance respectively. Results from the study showed that the mean score of the experimental group was higher than the mean score of the control group. The study also revealed that there was a statistically significant difference between the mean scores of those exposed to 7E's constructivist approach and those exposed to the traditional method. Therefore, it was recommended that teachers should use 7E's constructivist instructional model in teaching science subjects. Also,

students should be engaged in an active process of learning such as mind-on, hands-on, and exploration, so that they discover and create knowledge themselves as well as become independent problem solvers. Inquiry-based 7E strategy instruction in education has to be an integral part of pedagogy at the secondary school level irrespective of the cognitive styles of students should be encouraged among educators. This will aid in getting 21st-century skills in the learners.

2. LITERATURE REVIEW:

The majority of scholars have concluded that while teaching science subjects, the constructivist method is superior to the conventional approach. The constructivist method is quite beneficial for students who struggle academically.
Basu Susmita (2020): showed that there was a significant difference in the Mean Achievement Scores of students in the Experimental Group compared to the students in the Control Group. Students' perceptions regarding the pedagogy and effectiveness were also found to be positive.
Mala, Kanchan(2019): Major findings of the study reveal that the constructivist approach has a significant effect on the achievement of IX Class students in social science and social competence. Students differing in perception of the classroom environment have a significant effect on their achievement in social science.
Kalyanasundaram, R.M.(2018): Constructivism-based learning strategy was effective in the enhancement of science process skills among the IX standard learners.
Samaresh Adak -West Bengal (2017): the study found that the students exposed to the constructivist 7E model significantly achieved better than traditional methods.
Riri Marfilinda[1], Rona Rossa[1], Jendriadi[1], Sry Apfani[1] [1]Prodi PGSD STKIP Adzkia, Padang (2020) 7E Learning Cycle model gives an effect of 72% (moderate) to the improvement of student learning outcomes in the Basic Science Concept Course.
N. B. Naade1, J. I. Alamina 1, and P. C. Okwelle (2018): The study also revealed that there was a statistically significant difference between the mean scores of those exposed to 7E's constructivist approach.

3. OBJECTIVE:

To study the impact on student's academic achievement in Physics taught by the training module on the 7E model of the Constructivist approach (Experimental group) and the traditional teaching method (control group) of the standard IX students studying in secondary school English Medium affiliated to ICSE Board in Mumbai region.

4. HYPOTHESIS:

The following **null hypotheses** were formulated to guide the study.

- There is no significant difference in the post-test scores of students' academic achievement in Physics taught by the training module on the 7E model of the Constructivist approach (Experimental group) and the traditional teaching method (control group) of the standard IX students studying in secondary school English Medium affiliated to ICSE Board in Mumbai region.

5. TOOL / MATERIALS:

The following measuring tools based on principles of the 7E model of the constructivist teaching approach were used for the collection of data in the present study.

➢ Subject achievement test

Table No. 5.1: Experimental design: Pre-test Post–test matched Group Design.

Group	Pre-test	Treatment	Post-test
Experimental group	Achievement level toward the subject at entry-level	Teaching through the 7E model of the constructivist teaching approach	Achievement test
Control group	Achievement level toward the subject at entry-level	Teaching through traditional method	Achievement test

The research design for the present study is represented below:

O1 X O2 where O1, O3 are pre-tests X is experimental group

O3 C O4 where O2, O4 are post-tests C is control group

Table No.5.2: Reliability tool and statistics

➢ Reliability of tool used - Scale: ALL VARIABLES

Case Processing Summary			
		N	%
Cases	Valid	147	96.1
	Excluded	6	3.9
	Total	153	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
.860	105

The reliability coefficient of the tool, Cronbach's Alpha,α = .860.
The experiment set proposed study will be 'Two groups randomized subjects pre-test post-test non-equivalent group design'. The intact class of IX standard as a whole was considered as experimental and control groups for the study. This design is often used in classroom experiments when Experimental and Control groups are naturally assembled groups as intact classes, which may be similar (Best & Kahn, 2004).

6. METHOD:

The study undertaken by the researcher is an experimental method.
The population of the study is as stated:
The Researcher shall choose Standard IX students of National -Indian Certificate of Secondary Education, Delhi Board (ICSE board schools) English medium Secondary schools of Mumbai City, Maharashtra, Academic Year 2021-23, following the ICSE Syllabus as the population for the proposed study. While selecting the sample for the proposed study, the researcher will be adopting the purposive sampling method. Four schools that are affiliated with the Indian Certificate of Secondary Education, Delhi Board (ICSE) shall be purposively selected for the sake of convenience in experimenting with the study. The Researcher will randomly assign the group as Experimental and Control groups. One section of each of the selected schools belonging to class IX will be randomly taken as the experimental group and the other section of each of the selected schools will be taken as the control group. The sample size including both the Experimental and Control Group selected were 153 students in total.

6. ANALYSIS:

Table No.6.1: T test for post-test scores of achievement test between the Experimental and the Control group.

T-Test - Group Statistics	**GR**	**N**	**Mean**	**Std. Deviation**	**t-value**	**df**	**p-value**
PO_Academic Score	**Experimental**	**82**	**26.18**	**6.205**	**3.451**	**151**	**.001****
	Traditional	**71**	**23.13**	**4.453**			

Graph.6.1: Comparison of post-test mean score of achievement test between the Experimental and the Control group.

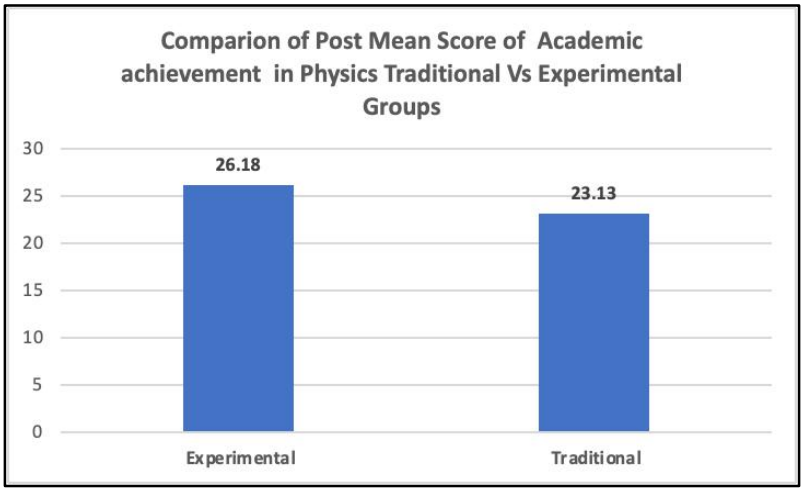


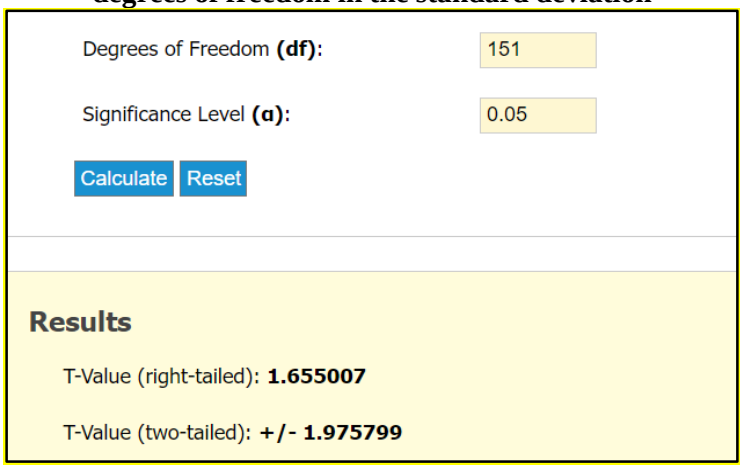
Table No.6.1: Independent sample test post-test scores of achievement test between the Experimental and the Control group.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PO_Acad PO_Academic Score	Equal variances assumed	6.090	.015	3.451	151	.001	3.056	.886	1.306	4.806
	Equal variances not assumed			3.532	146.174	.001	3.056	.865	1.346	4.766

7. FINDINGS:

Table No.7.1: T-Value Calculator to calculate the Student's t-value based on the significance level and the degrees of freedom in the standard deviation



From table 7.1 we can infer:

- The critical value of t for df = at 0.05 significance level is 1.655.
- The calculated value of t is =3.451 which is greater than the tabulated value at 0.05 level of significance.
- Therefore, the null hypothesis is rejected at a 0.05 level of significance, so we accept the alternate hypothesis.

There is a significant difference between the post-test scores of academic achievement in Physics taught by the training module on the 7E model of the Constructivist approach (Experimental group) and the traditional teaching method (control group).

The findings of this study may assist teachers in evaluating their teaching methods for students' understanding of Physics to improve their performance in the subject. This will enable students to pursue Physics and science-related causes in universities and colleges enabling the country to industrialize and achieve Vision 2030.

8. RECOMMENDATIONS FOR FURTHER RESEARCH:

The following are the recommendations for further research based on the findings of this research.

- The Impact of the factors such as students' age, gender, curriculum, and locality in the teaching and learning process in Mumbai schools should be studied.
- More studies should be done to investigate the effect of age and gender on students' achievement and attitude toward Physics.
- The constructivist teaching approach should be extended to other topics in Physics. More research involving the constructivist teaching approach should be done on Chemistry, Physics, and Mathematics so that more knowledge on the approach can be generated.
- It was recommended that the use of 7E's instructional approach in teaching and learning Physics should be encouraged, since it helps to stimulate students' curiosity and that training should be organized for chemistry teachers to equip them with knowledge and skill in using 7E's instructional approach.
- Findings may also be used by curriculum developers to make appropriate amendments to the selection of content, objectives, and evaluation approaches. Finally, it is hoped that the findings may stimulate further research on the appropriate methodologies in the teaching-learning of Physics.

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