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Effect of Constructivist 7-E Model of Teaching Algebra on Mathematical Interest of Students at Secondary Level

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Abstract

So far as the pedagogical process and practice is concern, the teaching learning process in class room situation is always influenced and affected by the instructional process by the means of strategies leading by method to achieve the instructional objective stated in lesson plan based on course objective, which is entitled to measure the achievement of the learner. Starting from traditional method to 5E model subsequently very recent innovation 7E model is concerned each and every subject in school education initially from primary to higher secondary level the achievement of the learner is always depends upon the implementation of pedagogy, specifically constructive approach leads to, meaning making process, especially in the mathematical area, therefore in this research work the researcher intended to facilitate the effectiveness of implementation of 7E model to measure the mathematical interest of learner in algebra selecting 312 sample as respondent out of total population covering four high school in Bargarh District of Odisha state on the basis of 5=1 ratio to population to sample to make it error free on the stated objective To find out the mathematical interest of students taught using 7 E model and traditional method and To compare the mathematical interest of student taught using 7 E model and traditional method for the smooth, successful, purposive and systematic complementation the statistical technique ANOVA to get the expected outcome of the result followed by Experimental method with suggestive suggestion and innovative recommendation along with successful conclusion.

INTRODUCTION

The constructivist classroom facilitates presentation of material in a constructivist way and engages students in an active collaborative learning. The prime task of a teacher in the constructive learning environment is to translate information to be learned into a format appropriate to the learner's current state of understanding. The teacher in the constructive learning approach sets up problems and monitors student exploration, guides student inquiry, and promotes new patterns and ways of thinking. As always guided by the teacher, students construct their knowledge actively rather than mechanically ingesting knowledge from the teacher or the textbook. In a nutshell it can be said that a constructivist teacher with constructivist teaching method lead pupils from 'memorization of facts to understanding, textbook-based learning to hands-on learning, content of abstractions to content of real world problem, lecture style instruction to interactive style of instruction, teacher-imposed information to pupil's self-discovery information, and product-oriented learning to process- oriented learning.

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CONSTRUCTIVIST APPROACH OF TEACHING

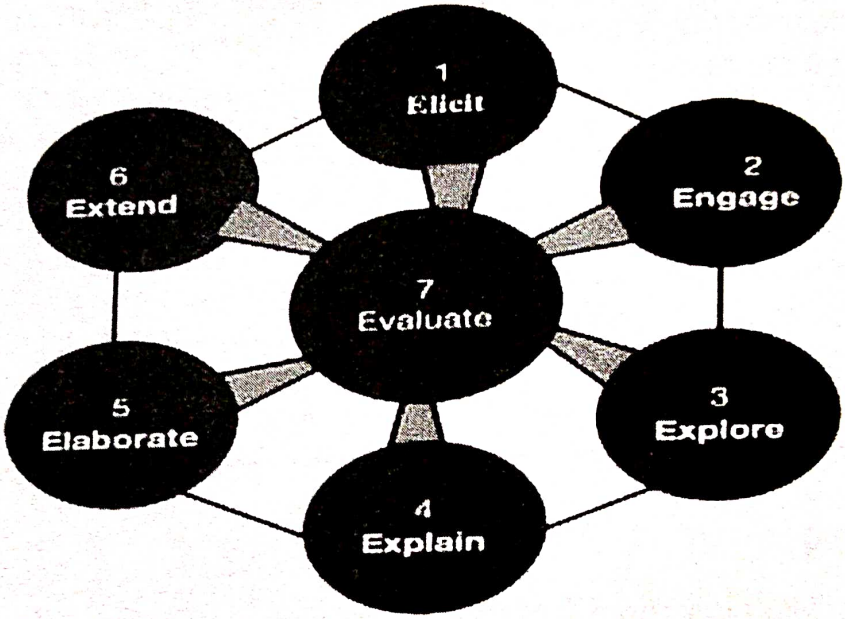
Constructivist teaching (sometimes called discovery learning) is an instructional method different from the traditional teaching. Constructivist teaching is typically student-centered discovery learning instead of teacher based "fact dissemination". The primary difference is that in constructivist teaching, students participate in hands-on activities and extend to construct their own knowledge.

7E MODEL

The 7E constructivist model is an expansion of 5E model in a constructivist approach to teaching that makes for a robust instructional approach. 7E model emphasizes "transfer of learning" and the importance of eliciting prior knowledge. The proposed 7E model expands the engaging element into two components- elicit and engage. Also, the 7E model expands the two stages elaborate and evaluate into three components elaborate, evaluate and extend.

7E Teaching Model

(Proposed by Yudhisthir Mishra and RSS Nehru-2019)



These changes are not suggested to add complexity but rather to ensure instructors do not omit crucial elements of the learning cycle. 7E's's instructional model (Elicit, Engage, Explore, Explain, Elaborate, Evaluate and Extend) is a model that emphasizes on these seven components as phases that should be adopted by science teachers in science teaching. It emphasizes "transfer of learning" and importance of "schema" which helps to engage the student in a new concept through the use of short activities that prompt curiosity and enthusiasm.

MATHEMATICAL INTEREST

According to Crow & Crow (1973), Interest may refer to the motivating force that impels us to attend a person, a thing or an activity or may be the effective experience that has been simulated by the activity itself. In other words, interest can be the cause of an activity and the result of participation in that activity. Here mathematical interest means that how much the student interested in mathematica concepts, principles, new trends and advancements in mathematics. In teaching learning field o mathematic, effectiveness largely influenced by mathematical interest of learner as well as teache

OBJECTIVE OF THE STUDY

1. To find out the mathematical interest of students taught using 7 E model and traditional method.
2. To compare the mathematical interest of student taught using 7 E model and traditional method.

METHOD

The Experimental method of research was adopted for the present study. The design selected for the study was pre-test and post-test non equivalent two group design.

SAMPLE

The investigator decided to adopt purposive random sampling keeping in view of the experimental nature of the study. The initial sample consists of 335 students, from selected schools of Bargarh district, studying in Standard IX of Odisha State syllabus. After removing absentees in pre-test and post-test, the total number of students included in the study was 312, out of which 156 students were coming under the Experimental group and other 156 students under the Control group.

ANALYSIS AND INTERPRETATION

Here the investigator tried to compare the Experimental and Control groups with respect to their mathematical interest. The analysis carried out under this regard is given in the following subsections.

- Comparison of students in the Experimental and Control groups with respect to mathematical interest for the whole sample

The analysis done under each subsection is given below.

Comparison of Students in the Experimental and Control Groups with Respect to Mathematical Interest for the Whole Sample

In this subsection, the analysis was done to compare the 7E Model and Traditional Method with respect to mathematical interest for the whole sample. The details of analysis are given under the following heads.

- Comparison of Pre-test, Post-test and Gain scores on mathematical interest of the Experimental and Control groups using 't' test
- Analysis of Genuineness of the mean difference in mathematical interest of Experimental and Control groups

The details of analysis done under each head are given below.

Comparison of Pre-test, Post-test and Gain Scores on Mathematical Interest of Experimental and Control Groups Using 't' test

The effectiveness of 7E Model on mathematical interest was found by comparing the mean Pre-test, Post-test and Gain scores on mathematical interest of the Experimental and Control groups using t test. The data and result of test of significance is given in the Table below;

Data and result of test of significance of difference between Pre-test, Post-test and Gain scores on mathematical interest

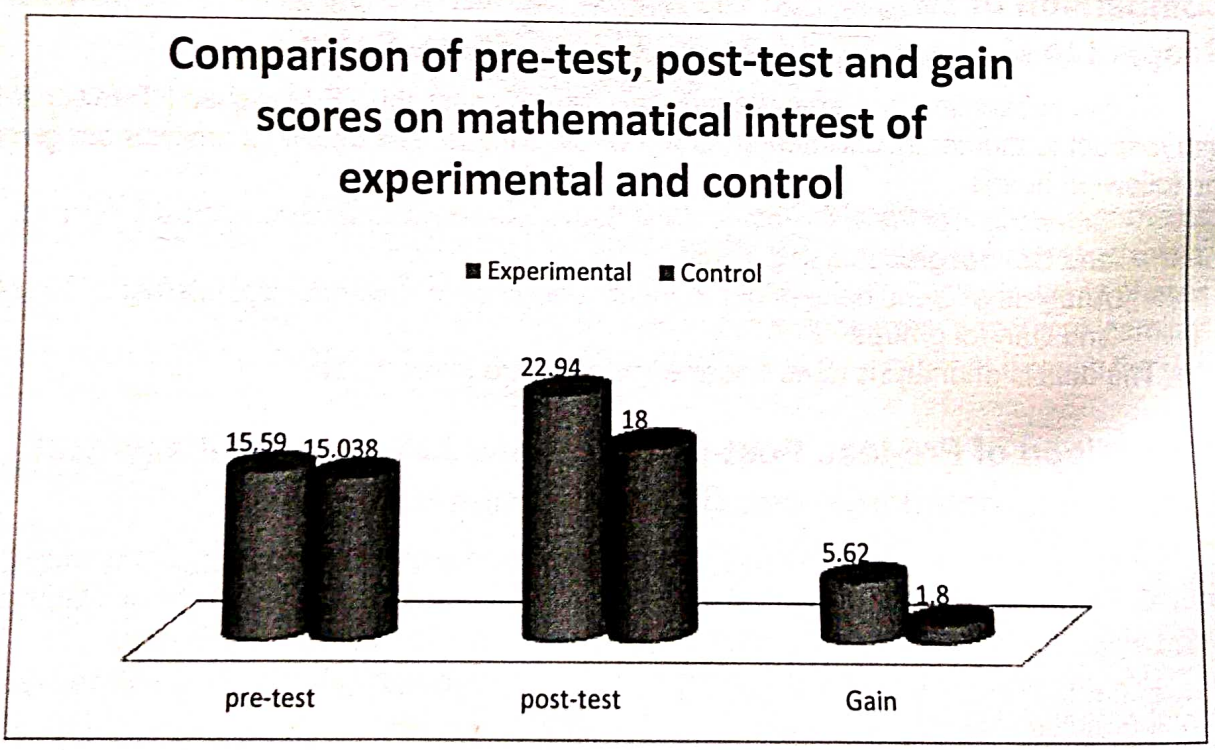
Scores	Groups	N	Mean	SD	t value
Pre-test	Experimental	156	15.59	4.0	1.09
	Control	156	15.04	4.86	
Post-test	Experimental	156	22.94	5.04	9.52**
	Control	156	18	5.03	
Gain	Experimental	156	5.62	4.445	10.51**
	Control	156	1.14	2.19	

** indicates that the values are significant at 0.01 level.

The t-value obtained for Pre-test scores on mathematical interest is 1.09 and it shows that there is no significant difference between mean scores of Experimental and Control groups with respect to their mathematical interest. It reveals that the Experimental and Control groups have almost similar mathematical interest, before the experimental treatment.

On comparison of students in the Experimental and Control groups with respect to Post-test scores on mathematical interest, it was revealed that the two groups differ significantly ($t=9.52$, $P<0.01$). It means that the Experimental and Control groups show significant difference on the Post-test scores on mathematical interest. The t- value of the Experimental and Control groups with respect to Gain scores of mathematical interest was found to be 10.51, which is significant at 0.01 level. The mean scores and t value reveals that the Experimental group taught through 7E Model showed more mathematical interest than the Control group taught through Traditional Method.

The comparison of Pre-test, Post-test and Gain scores on mathematical interest of both Experimental and Control groups can be depicted through a graphical representation which is given below in Figure



Graphical representation of the comparison of Pre-test, Post- test and gain scores of Experimental and Control groups with respect to mathematical interest

The analysis of Pre-test scores of students in Experimental and Control groups shows no significant difference in their mathematical interest. After using 7E Model to the Experimental group and Traditional Method to the Control group, the two groups differ significantly on mathematical interest. It can be inferred that 7E Model might have helped the Experimental group to show better mathematical interest than the Control group taught through Traditional Method.

Analysis of Genuineness of the Mean Difference in Mathematical Interest of Experimental and Control Groups

Since the sample selected for the present study were intact classroom groups from different institutions which were having a slight difference in the means of the Pre-test scores on mathematical interest, it is difficult to ascertain whether the difference between the Pre-test and Post-test scores resulted from the Experimental factor or other variables. So the scores were again analyzed using the technique of Analysis of Covariance (ANCOVA) for comparison.

ANCOVA uses the principles of partial correlation with ANOVA. It is appropriate when the subject in two or more groups is found to differ on Pretest or other initial variables. In this case, the effects of Pre-test and other relevant variables are partialled out and the resulting means of the Post-test scores were compared. The use of the statistical technique of ANCOVA in the present study is thus justified.

The scores obtained for Pre-test and Post-test scores on mathematical interest were subjected to ANCOVA. The procedure of analysis was given in three steps

- Analysis of comparison of mathematical interest of the Experimental and Control groups using Analysis of Variance
- Analysis of comparison of mathematical interest of the Experimental and Control groups using Analysis of Covariance
- Analysis of comparison of mathematical interest of the Experimental and Control group using Adjusted Means.

The details of the analysis carried out under each subhead are given below.

Analysis of Comparison of Mathematical Interest of the Experimental and Control Groups Using Analysis of Variance

In this part of analysis the total sum of squares, mean square variance and F-ratio for Pre-test and Post-test scores of mathematical interest of the Experimental and Control groups were computed. The Analysis of Variance Table is given below.

Summary of analysis of variance of the Experimental and Control groups for the Pre-test and Post-test scores on mathematical interest

Source of variation	Df	SSx	SSy	Msx	Msy
Among Mean	1.00	16.16	3420.2	16.16	3420.16
Within Groups	310.00	6372.76	7543.9	20.56	24.36
Total	311.00	6388.92	10964.1		

Fx= 0.79 Fy = 140.54

From table, the value of 'F' for df 1/310 is 3.86 at 0.05 level and 6.7 at 0.01 level. The obtained value of Fx is 0.79, which is not significant at both the levels. It shows that there is no significant difference between Pre-test scores of Experimental and Control groups with respect to their mathematical interest. The obtained Fy value is 140.54 which is significant at 0.01 level. This shows that the two groups differ significantly on Post-test scores of mathematical interest. So the Pre-test and Post-test scores obtained on mathematical interest were subjected to ANCOVA.

Analysis of Comparison of Mathematical Interest of the Experimental and Control Groups Using Analysis of Covariance

Sum of Squares and Adjusted Mean Square Variance for Post-test scores were computed and F ratio was calculated. The results of the analysis are presented in the Table below.

Summary of Analysis of Covariance of the Pre-test and Post-test scores on mathematical interest of the Experimental and Control groups

Source of Variation	Df	SSx	SSy	SSxy	SSyx	MSyx	SDyx
Among Mean	1.00	16.16	3402.2	235.07	3031.31	3031.31	
Within groups	309.00	6372.76	7543.9	5319.12	3104.05	10.05	3.17
Total	310.00	6388.92	10964.1	5554.19	6135.56		

Since the Fyx ratio (301.74) is greater than the table value, 6.70 at 0.01 level, it is significant. The significant ratio for the adjusted Post-test scores shows that the mean scores on mathematical interest of students in the Experimental and Control groups differ significantly, after they were adjusted for the difference in the Pre-test scores. The significant F- ratio necessitates the proceeding to test the difference separately by 't'-test.

Analysis of Comparison of the Mathematical Interest of the Experimental and Control Groups Using Adjusted Means

The adjusted means for the Post-test scores on mathematical interest of students in the Experimental and Control groups were calculated using regression coefficient. The data and results are shown in the Table below.

Data and result for Adjusted Means of Post-test scores on mathematical interest of Experimental and Control groups

Groups	N	Mx	My	Myx	t value
Experimental	156.00	15.49	22.73	22.73	
Control group	156.00	15.04	16.3	16.49	17.39
General means	312.00	15.27	19.61		

The difference in adjusted means for Post-test scores on Mathematical interest of the Experimental and Control groups were tested for significance for df 1/309. The obtained t value is 17.39, which is significant at 0.01 level, since t value from table is 1.97 and 2.59 at 0.05 and 0.01 levels respectively. Thus it is clear that after treatment, there is significant difference between the Experimental and Control groups with respect to Post-test scores on mathematical interest. It can be inferred that

teaching through 7E Model might have helped the students to show better mathematical interest than those taught through Traditional Method.

MAJOR FINDINGS OF THE STUDY

The analysis of the Pre-test scores on mathematical Interest of the Experimental and Control groups shows that the 't' value obtained is 1.09 which is not significant at 0.01 and 0.05 levels. On comparison of the Posttest scores (t=9.52) and Gain scores (t=10.51) of the Experimental and Control groups with respect to mathematical Interest it is revealed that the Experimental and Control groups differ significantly at 0.01 level. The t value and mean scores reveals that students in the Experimental group achieved more mathematical Interest than the Control group. Thus it can be inferred that the teaching through 7E Model might have helped the Experimental group to develop more mathematical Interest than Control group, taught through Traditional Method.

On comparing the Experimental and Control groups with respect to Post-test scores using ANOVA, the obtained value Fx=0.79, which is not significant. It shows that there is no significant difference between Pre-test scores of the Experimental and Control groups with respect to their mathematical Interest. The obtained Fy value is 140.54, which is significant at 0.01 level. This shows that the Post-test scores of the Experimental and Control groups differ significantly on mathematical Interest.

Using ANCOVA the Pre-test and Post-test scores of the Experimental and Control groups were compared with respect to mathematical Interest. The Fyx ratio obtained is 301.74 which is greater than the table value and is significant at 0.01 level. The significant Fyx ratio for the adjusted Post-test scores on mathematical Interest shows that the final mean scores of students in the Experimental and Control groups differ significantly after they were adjusted for the difference in the Pre-test scores.

The difference in Adjusted Means for Post-test scores of the Experimental and Control groups were tested for significance for df 1/309. The obtained t value is 17.39, which is significant at 0.01 level. This shows that students taught through 7E Model attained better mathematical Interest than those taught through Traditional Method.

CONCLUSION

Conclusion is arrived at on the basis of the major findings. Comparison of the mathematical Interest of the Experimental and Control groups shows significant difference between the Pre-test and Post-test scores using t test and ANCOVA. The Experimental group shows better mathematical Interest than the Control group. Thus it can be concluded that mathematical Interest of students taught through 7E Model is significantly higher than that of students taught through Traditional Method. Information on 7E provides a useful framework for understanding learners and identifying gaps in the teaching methods. Rather label students, teachers can use this knowledge to determine whether their approach to subject matter offers choice and variety.

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