

# The Effectiveness Of Constructivist Pedagogy On Mathematical Concept Attainment

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## Abstract

In the present research all the class seventh students of U.P. board belonged to Lucknow city the population and all the 47 students of class seventh of 'Upper Primary School Mukarimnagar Lucknow' were the sample of the study. The school was selected by purposive sampling and students were selected by the lottery system of random sampling. The researcher taught all 20 students of the experimental group through self-made constructivist pedagogy-based teaching modules by using the "Non-Equivalent Post-Test-Only Control Group design". The 20 students in the control group were taught the pre-determined unit from the selected mathematical books by using the traditional teaching method. For the evaluation of obtained data used the self-developed and standardized 'concept attainment test'. The normality was found 0.586 of the experimental group and 0.831 was found of the traditional group. The value of homogeneity of variance was found 0.490. The mean of concept attainment test scores of the experimental groups was 31.55 and the mean of the control group was 20.85. The obtained t-value 9.1688 was significant at 0.01 level. Hence constructivist pedagogy method would be found 78.87% effective and the traditional teaching method was 52.12% effective to enhance mathematical learning and concept attainment of students.

**Keywords:** Constructivism, Concept Attainment, Constructivist Pedagogy, Mathematics.

## Introduction

Constructivism means the construction of knowledge by own. It believes that humans create their own knowledge. He gets experiences from the environment in which he lives. These experiences go on connecting with each other and through the synthesis of these experiences new knowledge is generated whose level is individual. Some differences are definitely found in the social

environment and ability of a person, due to which the experiences acquired by each person are different. As a result, their knowledge is also different from each other. Constructivism has proved to be very important in classroom teaching, the students learn with the help of various activities in the classroom. They learn in a practical way to the subject matter through activities that lead to education and educational experience. Here the students are the center point of the whole teaching-learning process and the teacher as a guide or facilitator suggests the solution of the problem asked by the students. The students participate in group activities with their classmates. In the education world, the use of the constructivist approach was very helpful in the teaching of various subjects like Biology and Geography, especially Mathematics subject. Mathematics has been a very difficult and typical subject for all students. The solution of Mathematical questions cannot be memorized whereas in the other subjects, students can be memorized the long explanations of problems without any understanding of them.

Research conducted in the past makes it clear that various principles can be easily understood through constructivism. No subject matter can be easily understood through constructivism. No subject matter can be explained until its basic point or principle is understood by the students. So due to the heterogeneity and the expectation of a deeper understanding of the mathematics subject, the researcher used constructivist pedagogy in mathematics subject teaching to explain the mathematical concepts to the students. Therefore, the researcher wanted to study the effect of constructivist pedagogy on mathematical concept attainment.

### **Objectives of the study**

To find out the effectiveness of constructivist pedagogy on mathematical concept attainment among class Seventh students.

### **Hypothesis**

There was no significant difference between the concept attainment of the experimental group and the control group of students.

### **Delimitations**

1. The presented research work is limited to all upper primary schools in Lucknow districts.
2. The research is limited to the students of the affiliated school from the U.P. Board.
3. The research is restricted to class Seventh students.
4. The research is limited only to mathematics teaching-learning.
5. The research was conducted on the specific selected topic from the whole mathematics syllabus of class Seventh students of the U.P. board.

### **Reviews of Related Literature**

Hari Prasad Upadhyay (2001) was found in his research that the constructivist approach is more effective to upgrade the students learning than the traditional teaching method. Ranu Mandal (2013) explored that the constructivist approach was very useful to facilitating and enhancing the

learning of secondary school students. Ravula Krishnaiah (2013) was found in the result of his research that the constructivist approach is more effective on male teachers in comparison to female teachers, and the constructivist approach more effective for Junior High School teachers than Senior High School teachers. It had also been proved that the perception ability of private school teachers was more than that of government school teachers and the perception ability of urban teachers was more than rural teachers.

The review of various research related to the constructivist approach revealed that the constructive approach is more effective than the traditional teaching method to facilitate and enhance the students learning. The constructivist approach proved to be more effective on male students, Junior High School teachers, private school teachers, and urban teachers.

Shyamsundar Bairagaragya (2006) was found in his study that Advance Organizer Model (AOM) was more effective than the Concept Attainment Model (CAM) to enhance the cognitive learning of students. Kiran Dammani (2011) was found through research that the concept mapping strategy more useful and significant than the Concept Attainment Model (CAM) and traditional teaching to learn and understand English grammar concepts. The increased understanding of English grammar concepts did not affect students' creativity. Nirupama (2013) reported that using Computer Assisted Instruction (CAI) the students' mathematical learning increased upto 83% while mathematical concepts were learned upto 78% through traditional teaching method.

Various types of research conducted on concept mapping, Advance Organizer Model (AOM), Concept Attainment Modal (CAM) and Computer Assisted Instruction (CAI), etc., but no any researches have been found that considered concept attainment as a variable. The researcher found the research gap in the field of educational research.

### **Significance of the Research**

Various research studies had clearly shown that the constructivist approach is very useful in the teaching-learning process. It enhances students learning and many research have conducted regarding the concept attainment model but no research had been done on the concept attainment variable till now. It was found to be a big research gap in the research world. Therefore, it was considered necessary to study the effect of the constructivist approach on the mathematical concept learning of the students. The student believed that mathematics was a more difficult subject generally. It was considered more important by the researcher to study the effect of the constructivist approach on mathematical concept attainment.

### **Research Method**

The experimental method has been used in the study and the treatment was given through self-developed instructional material (teaching modules).

### **Research Design**

The 'Non-Equivalent Posttest Only Control Group' design was used to conduct the experiment.

### **Population**

All the students of class Seventh students of U.P. board Lucknow city were the population of the study.

### **Sample Selection**

The 'Upper Primary School Mukarim Nagar Lucknow' was selected using purposive sampling. The school of 47 students of class Seventh was divided into the experimental and the control group with equal numbers of students through the lottery system.

### **Sample**

Out of the 47 students, the 40 students who were present continuously in the class, 20 students were distributed to the experimental group and 20 students were distributed to the control group through the random assignment and random selection process.

**Table 1: Sample**

<b>Experiment Sample</b>	<b>Students</b>
Total No. of Students	40
The experimental group	20
The control group	20

### **Variables of the Study**

The 'constructivist approach' and 'conventional teaching' methods were the independent variables, the 'concept attainment' was the dependent variable, and the teacher characteristics, learner characteristics, classroom environment, and teaching materials were the control variables of the study.

### **Tools of the Study**

1. Self-made instruction material based on the 7-E modal of the constructivist Approach.
2. Content of the selected unit-3, 'Exponent and Power' of Class 7th mathematics book of Basic Shiksha Parishad.
3. Self-developed and standardized 'Concept Attainment Test'.

### **Analysis**

The Kolmogorov-Smirnov and Shapiro-Wilk test (KSSWT) was used to test the normality of the sample. The two independent samples i.e., the experimental and control group of students were

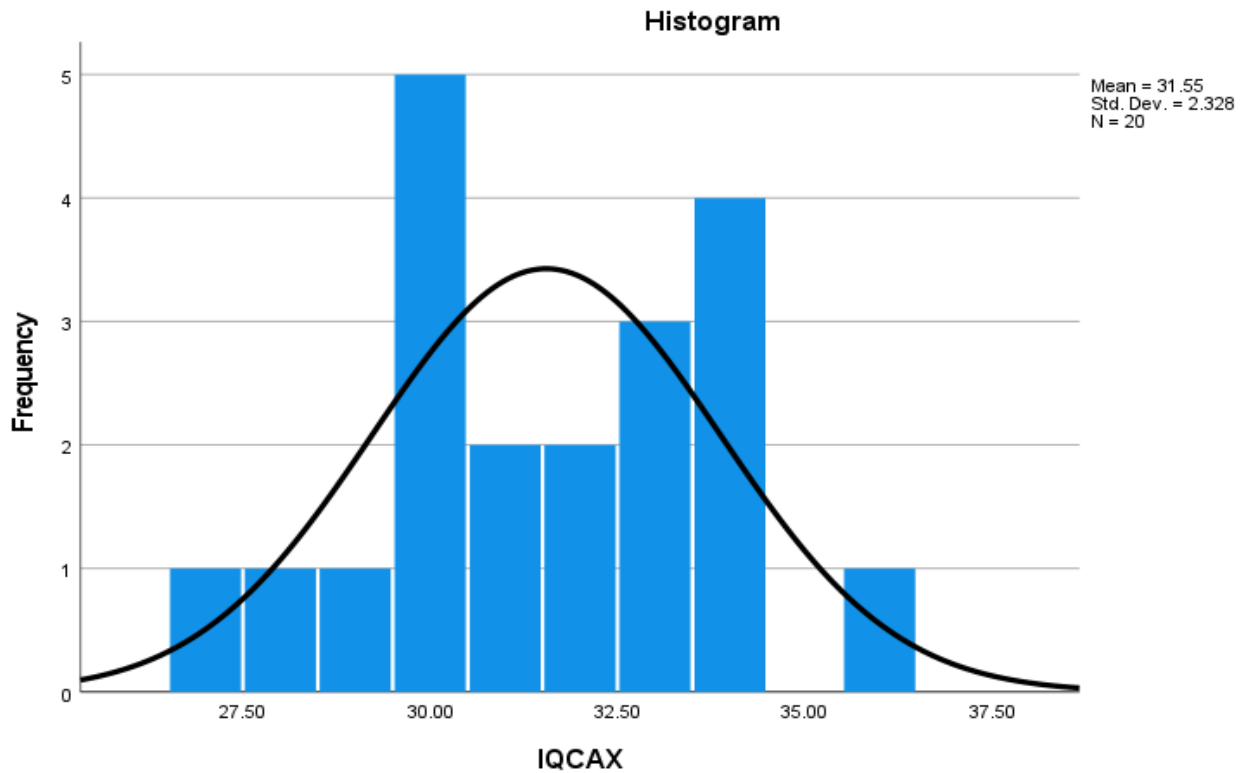
tested separately. The effect of the independent variable ‘constructivist pedagogy’ was tested on the dependent variable ‘mathematical concept attainment’ with experimental and control groups of students.

Tests of Normality							
CA Posttest	Group	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
	Experimental	.147	20	.200*	.962	20	.586
Control	.121	20	.200*	.974	20	.831	
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

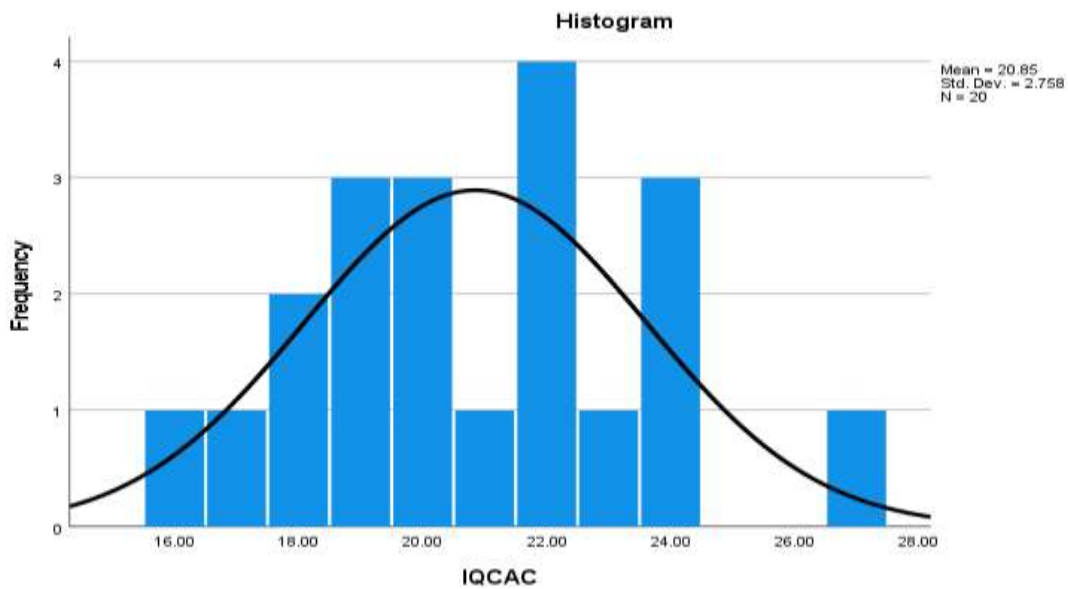
**Table 2: Kolmogorov-Smirnov and Shapiro-Wilk Test on the students of Experimental and Control Groups of Concept Attainment**

It can be seen that the p-value of the post-test of the experimental and control group is 0.586 and 0.831 respectively, which was greater than the prescribed value of 0.05 (table:2), i.e., the distribution of the concept attainment in the experimental and control group were normal with the NPC of Concept attainment score of experimental and control group separately (fig:1)

**NPC with Histogram Plot of the Raw Scores of Concept Attainment of Experimental Group**



**NPC with Histogram Plot of The Raw Scores of Concept Attainment of Control Group**



**Fig. 1: NPC with Histogram Plot between Experimental and Control Groups of Students on Concept Attainment**

Levene's test was used to test the homogeneity of the two independent samples. The 0.490 value of the test was obtained, which was greater than the prescribed value of 0.05 (table: 2).

Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
CA Post	Based on Mean	.487	1	38	.489
	Based on Median	.470	1	38	.497
	Based on Median and with adjusted df	.470	1	35.618	.497
	Based on trimmed mean	.486	1	38	.490

**Table 3: Levene's Test of Experimental and Control Groups of Students on Concept Attainment**

It shows that the concept attainment of the students of both groups was the same i.e., both independent group experimental and control were homogeneous with respect to each other.

Now the two-tailed significance t-test was used to know the effect of constructivist pedagogy through normal and homogeneous experimental and control groups.

Group	Mean	SD	N	Df	t-value	Significance
The experimental group of Concept Attainment	31.55	2.32775	20	38	9.1688	Significant t > 2.03 at 0.05 level t > 2.72 at 0.01 level
The control group of Concept Attainment	20.85	2.75824	20			

**Table-4: Two-tailed Significance t-test between the Experimental group and Control group of Concept Attainment**

The mean value of the concept attainment scores of the experimental group of students was 31.55 and the control group was 20.85. The obtained 't' value between these two samples was 9.1688, which was greater than the table value 2.03 of the t-test at df 38 at 0.05 significance level and 2.72 table value of t-test at df 38 at 0.01 significance level. The mean of Concept attainment scores of

the experimental group was significantly higher than the mean of Concept attainment scores of the control group students. Therefore, it proved that the students of the experimental group who taught through the constructivist pedagogy method by using instructional material have significantly high mathematical concept attainment than those students of the control group who taught through the traditional teaching method.

### **Findings**

The experimental group of students was taught through the constructivist pedagogy method by using instructional material have achieved high mathematical concept attainment than those students who were taught through the traditional teaching method. In the post phase of the experiment applied Concept Attainment Test (CAT) secured maximum 40 marks and one mark is given for every correct answer. So according to the mean value 31.55 of concept attainment scores of the experimental group, the students achieved 78.87% mathematical concept attainment and the mean value 20.85 of concept attainment scores of the control group, the student achieved 52.12% mathematical concept attainment. Hence, the constructivist pedagogy method was found 78.87% effective and the traditional teaching method was found 52.12% effective for students to learn mathematical concepts.

### **Interpretation**

In the 40 days experiment, the 20 students of the experiment group were taught according to the constructivist pedagogy-based teaching modules. In which they were made to do various activities related to the mathematical concept. So, they could understand the mathematical concept better. In this, by forming groups of students they were given various practical works related to the activity. Which they had to complete after discussing among themselves. With the completion of the activity, the students started learning related mathematical concepts independently. Due to this, their concept attainment increased more easily. if they had any problem with this then the teacher guided them as a facilitator. The control group was taught through traditional teaching with chalk and talk method. The teacher explained the concept to the students on the board according to the selected content of the unit given in the mathematical Books with the examples.

The students obtained 78% mathematical concept attainment taught through the constructivist pedagogy method and the students of the control group obtained 52.12% mathematical concept attainment taught through the traditional teaching method. Hence proved that by using constructivist pedagogy in mathematical teaching-learning, students achieved high concept attainment than the traditional teaching method.

### **Conclusion**

The constructivist pedagogy method was found 78.87% and the traditional teaching method was found 52.12% effective to attain the mathematical concepts.



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