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EFFECT OF CONSTRUCTIVIST APPROACH ON ACHIEVEMENT IN MATHEMATICS OF ELEMENTARY SCHOOL STUDENTS

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Abstract

The present study was conducted to study the effect of constructivist approach on achievement in mathematics of elementary school students. The sample comprised of 128 students from four schools affiliated with P.S.E.B Mohali. The data was analyzed with the help of mean, standard deviation and t-test. The major findings of the study were in favor of constructivist approach of teaching.

***Keywords**: Constructivist approach*

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INTRODUCTION

The world of today which depends more and more heavily on science and technology demands more and more mathematical knowledge. Mathematics plays a big role in developing human thoughts, bringing strategic, systematic reasoning processes used in problem analysis and solving. It helps people to be able to anticipate, plan, decide, and properly solve each problem in daily life. Thus mathematics is useful to our living, helping to improve the quality of life (The Basic Education Core Curriculum, 2008). Mathematics has the ability to confuse, frighten and frustrate learners of all ages. If a child has negative experience in mathematics, that experience would affect his/her achievement as well as attitude towards mathematics during adulthood. The obvious question is whether students' failure to learn mathematics can be ascribed to problems of curriculum, problem of teaching, or the student ,or perhaps the combination of these (Carnine,1997).There are many possible reasons as to why students fail in mathematics. But most of the reasons are related to curriculum and methods of teaching rather than the students' lack of capacity to learn (Carnine, 1991, Jones, Wilson, and Bhaswani, 1997).Airasian and Walsh (1997) argue that the existing mode of teaching of mathematics in schools has not fulfilled the needs of the vast

majority of our students, and that not nearly enough instructional stress is put on the higher order skills. Traditional method of teaching makes the learner to memorize information, conduct well organized experiments and perform mathematical calculations using a specific algorithm and makes them submissive and rule-bound. The traditional teacher as information giver and the textbook guided classroom have failed to bring about the desired outcomes of producing thinking students (Young and Collin, 2003).

Classroom teaching practice becomes more effective, when it is well informed by an understanding of how students' learn and learning will be more successful if students are given the opportunity to explain or clarify their ideas. So in terms of pedagogy ,the development of education now requires teaching strategies that emphasize student involvement in their learning, where focus is on knowledge construction rather knowledge transformation. Researchers have shown that learning strategy in classroom can be very effective in encouraging student interaction and consequently enhanced students' achievement. It is therefore essential that the major implication of learning theory should be reflected in classroom practices in a more child focused manner (Nayak, 2007).Constructivism is an emerging pedagogy among the teaching community across the world and National Curriculum Framework (NCF 2005) developed by National Council of Education Research and confirmed the direction to it in Indian classroom situation. However, the question is how to implement classroom teaching that is consistent with a constructivist view of learning is still remains a major concern, particularly its feasibility at elementary classroom.

A much heralded alternative is to change the focus of the classroom from teacher dominated to student-centered using a **constructivist approach**

It is important to realize that **the constructivist approach borrows** from many other practices in the pursuit of its primary goal: helping students learn how to learn. The benefits of constructivism can be described as:

- Students learn more enjoyably and are more likely to retain learning.
- Students learn how to think and understand.
- It is transferable skill to other settings.
- Students have ownership of their own learning.
- It applies natural curiosity to real world situations.
- Promotes social and communication skills within a group setting(Pagan, 2006)

CONSTRUCTIVISM: Constructivism is an approach to teaching that acknowledges that information can be conveyed but understanding is dependent upon the learner. Constructivism is child-centered; it proposes that learning environment should support multiple perspectives or interpretations of reality, knowledge construction, context-rich, experience-based activities. Constructivism focuses on knowledge construction, not knowledge reproduction. The mind is instrumental and essential in interpreting events, object and perspectives on the base that is personal and individualistic. Our view of the external world differs from others because of our unique set of experiences. Constructivism is basically a theory based on observation and scientific study about how people learn. By experiencing different things and reflecting o those experiences, people construct their own knowledge and understanding of the world. When we encounter something new, we have to reconcile it with our previous ideas and experience, maybe changing what we believe, or maybe discarding the new information as irrelevant. In any case, we are active creators of our own knowledge. To do this, we must ask questions, explore and assess what we know.

REVIEW OF RELATED STUDIES

. Kesal (2003) found that learning activities, evaluation strategies, student learning experiences and instructors' roles in the classroom should be reconsidered and improve in order to make it more constructivist in nature. Karaduman (2007) found that constructivist learning principles based learning materials increase students academic stress and retention in social studies but don't increase attitudes. Hussain (2012) revealed that students enjoyed working on collaborative and cooperative projects. Ramon & Oluyemi (2013) found that constructivist method pedagogy was more effective in improving classroom practices of pre-service teachers and it is strategy that supports such outcomes which are clearly and vital importance to mathematics. Tugba (2013) found that constructivist teaching practice levels of pre-service mathematics Teachers was statistically significantly correlated with problem solving in negative way and creative ability in positive way. Tuncel (2015) found that a learning environment that includes active learning, reflecting learning, associating with life and assessing simultaneously with teaching were created in teaching-learning process in content knowledge courses. Chowdhary (2016) showed that there exists significant difference on the achievement of the students taught through constructivist approach sand conventional method of teaching. These studies consists the idea of constructivist approach that makes teaching technique more effective than those of traditional methods.

RATIONALE OF THE STUDY

In order to strengthen the mathematical programme with recent trends of the scientific thinking, it demands strong foundation in the knowledge of the mathematics at the school level. The present day teaching of mathematics in India is not satisfactory. It is believed the entire world of phenomena can be interpreted mathematically. The new scientific, industrial and computer revolution in our country makes it all the more imperative to denote special attention to the study of mathematics as it plays an important part in technical professions. Mathematics is one of those human activities that man has created to gratify certain human needs and desires. It is believed that study of mathematics requires special mental ability and requires great efforts. It is not everybody's cup of tea. As far as the special ability for mathematics is concerned, it has been proved that it requires a lot of practices. Mathematics develops the power of thinking and reasoning. It gives mental exercise best fitted for strengthening the faculties of the brain. It is the only subject that encourages and develops logical thinking. It enables the students to discriminate between essential and non essential things. It helps them to shift facts, to draw conclusions without ambiguity and that it is a subject by which they may learn what is meant by rigid reasoning. Study of mathematics has various objectives at the various stages of school education which can be described as it aims at to enable the students to understand mathematical principles, concepts, processes, to develop the technique of problem solving among them, so that they may able to express their thoughts clearly and accurately. It also aims to develop critical attitude among the students to solve the problems of mathematics. But these objectives of teaching mathematics are not generally achieved, due to various reasons like traditional approach of teaching mathematics has been used by teachers in the class rooms. The teachers presume that children do not know anything. Hence the classroom remains dominated by teachers thus resulting in teacher centeredness. Though we speak of child centered learning we have never tried to create an environment in the classroom. The teachers use traditional methods of teaching and learning, based on Objectivist view of knowledge. Objectivism is based on the assumption that knowledge is objective, universal and complete and it can be imparted by those who have it, to those who do not have it. Constructivism on the other hand is based on the assumption that knowledge is subjective, Contextual and inherently partial. It is necessary to see that what child already knows links with the present knowledge; how it is related and how he learns a particular concept. The mathematics teaching should involve a scientific method that will help the child to think critically and develop scientific skills in them. But in classroom,

methods used by the teachers do not cater to those objectives. Usually in classroom, mathematics teaching takes place through conventional methods without hands on experience. Such a mathematics instruction does not develop cognitive abilities among students but focuses only on the information of facts and preparing students for examination. Hence there is need to try those methods, which help in sharpening the cognitive abilities of the students.

The present study has been undertaken with an objective to study the effect of constructivist approach on the achievement of the students in mathematics

OBJECTIVES OF THE STUDY

(i) To develop lesson plans based on constructivist approach for selected units of mathematics.

(ii) To develop and standardize achievement test for selected units of mathematics.

(iii) To compare the achievement in mathematics of students taught with constructivist approach (experimental group) and conventional method of teaching (control group).

HYPOTHESES OF THE STUDY

The present study was designed to test the following hypotheses:

H_1: There is no significant difference in the achievement in mathematics of students taught with constructivist approach (experimental group) and conventional method of teaching (control group).

$H_{1.1}$: There is no significant difference on knowledge in Mathematics of elementary school children.

$H_{1.2}$: There is no significant difference on understanding in Mathematics of elementary school children

$H_{1.3}$: There is no significant difference on application in Mathematics of elementary school children

DELIMITATIONS OF THE STUDY

The present study was delimited in the following aspects.

The study is limited to four schools of Amritsar.

The study is limited to Class VIII students only

VARIABLES OF THE STUDY

There were two types of variables.

i) The independent variables

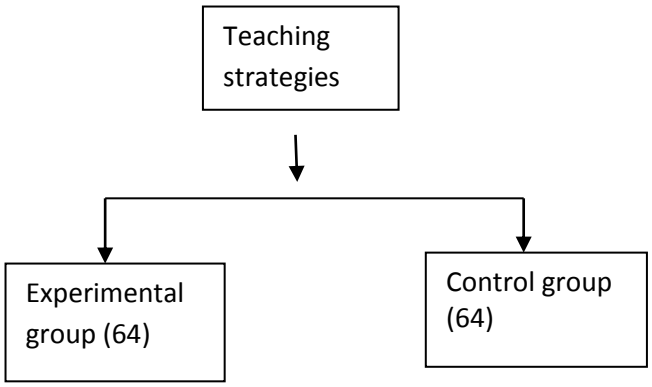
a) Constructivist approach

b) Conventional method of teaching

ii) The dependent variable

a) Achievement in mathematics

RESEARCH DESIGN



SAMPLE

In the present study random sample of 128 students (64 for Experimental group and 64 for control group) of VIII grade from

(i) Jagat Jyoti Senior Secondary School, Amritsar. .

(ii) Khalsa College Senior Secondary School,Amritsar. .

(iii Khalsa Girls Senior Secondary School, Amritsar.

(iv) P.N.B Senior Secondary School, Amritsar affiliated to P.S.E.B was taken

RESEARCH TOOL

The following tools were used for collecting data:

1. An Achievement Test in mathematics was developed and standardized by the investigator herself to measure the achievement of students before and after the treatment.
2. 30 lesson plans based on constructivist approach from selected topics of mathematics was prepared.

STATISTICAL TECHNIQUES: Mean, Standard deviation and t-test was calculated to find out the results.

MAJOR FINDINGS

Findings are the precise effect of the research process by testing hypothesis through some useful statistics (suresh,2014).It is highlights of the research where the researcher or the investigator focused before investigtation. The following are the findings:

Table 1 t-ratio of mean gain score of experimental and control group:-

Variable	Experimental Group			Control Group		SE_D	t-ratio
	N	Mean	SD	N	Mean		
				SD			
Gain Scores	64	18.78		64	12.75	0.80	7.48**
	4.58			4.52			

***Significant at 0.01 level*

(Critical Value 1.66 at 0.05 level and 2.62 at 0.01 level, df 126)

A bar diagram has been drawn to depict the mean gain scores on achievement in Mathematics and has been presented in fig1.

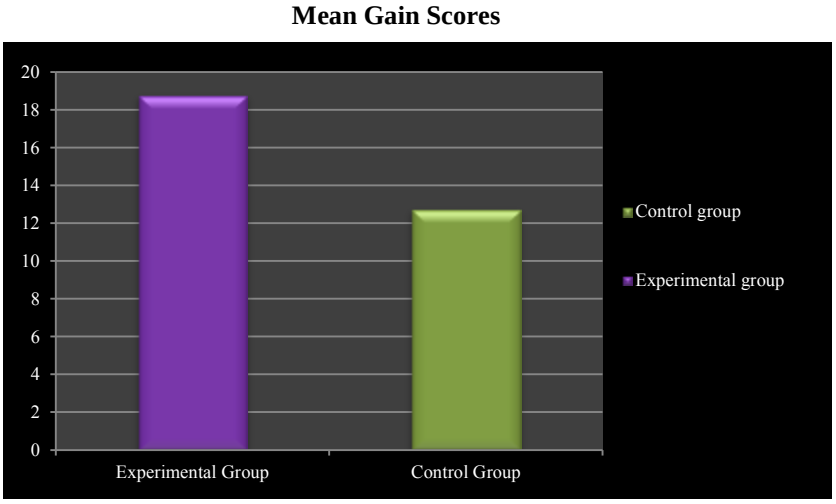


Fig 1 Bar diagram showing comparison of mean gain scores of treatment and control group

As achievement of an individual refers to higher mental acquisition which includes the ability of Knowledge, Understanding and Application.In order to confirm which dimension of achievement test really differ between two groups after given the treatment, the mean, SD, and t-value applied as shown in table

Table 2 Post-test mean, SD and t-value for different dimension of Achievement for two groups.

Test	Different dimension of Achievement test	Groups(N)	Mean	S.D	t-value
Achievement test	Knowledge	Exp.(64)	7.24	3.28	0.91
		Cont.(64)	6.73	3.16	
	Understanding	Exp.(64)	22.17	4.57	9.90**
		Cont.(64)	14.22	5.53	
	Application	Exp.(64)	12.6	3.75	5.74**
		Cont.(64)	8.53	4.27	

***Significant at 0.01 level*

(Critical Value 2.00 at 0.05 level and 2.66 at 0.01 level, df 62)

RESULTS OF THE STUDY

i) Students of experimental group exhibited better mean gains than students of control group when taught by constructivist approach.

ii) Students of experimental group exhibit better mean scores on different dimensions of achievement test than conventional method of teaching.

SUGGESTIONS FOR FURTHER STUDY

1) The research may be conducted at higher classes.
2) Achievement Test must contain more questions.
3) The opinion of good number of experts may be taken.
4) A sample containing more students may also be taken.

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