AN IMPACT OF TECHNOLOGY BASED CONSTRUCTIVIST TEACHING ON MATHEMATICS ACADEMIC ACHIEVEMENT OF VIII STANDARD STUDENTS OF BHOPAL CITY

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Abstract

Modern education emphasizes on learner centered and joyful learning which is the new initiated by educationists. They believe that, children need to keep active throughout the teaching and learning process and encourage self-learning and independent learning. Constructivist teaching changed the educational practice and converted Passive Learner Centered Environment into Active Learner Centered Environment. An Impact of Technology Based Constructivist Teaching on Mathematics Academic Achievement of VIII Standard Students of Bhopal City .The main objective of the study is to compare the effectiveness of Constructivist Teaching and Mathematical Based Constructivist Teaching on academic achievement of VIII standard students in Mathematics subject. The present study is experimental in nature with two equivalent group designs. In this study purposive sampling technique is used. The sample comprised of 79 students studying in VIII standard of two schools (Government and Private School) of Bhopal city affiliated to state or CBSE board.

Key Boards: *Constructivist Teaching, Mathematical based Constructivist teaching, Achievement scores*

INTRODUCTION

Constructivism is simply a theory about knowledge and learning with implications for teaching. Constructivism has grown out of the synthesis of three disciplines namely, cognitive psychology, philosophy and anthropology. Each has its own view about the theoretical bases. Originated with the Jean Piaget, the tradition of constructivism bifurcates into, on the one hand, the more personal, subjective tradition of Piaget that can be seen in Von Glasersfield's work, and
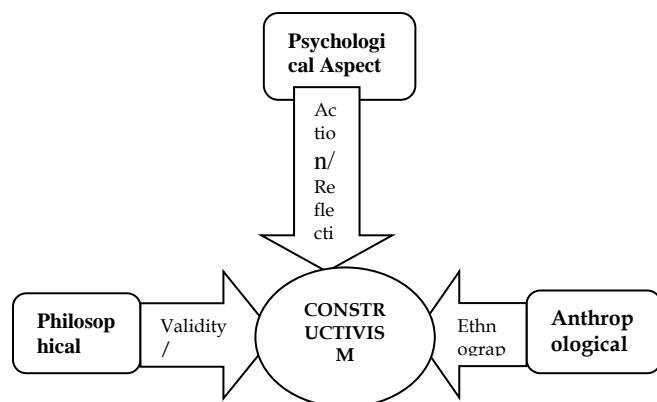
on the other hand, is the social constructivism of Vygotsky and Lave, who stress the importance of language communities of the cognitive construction of individual. On the whole the theory defines knowledge as temporary,

developmental and socially and culturally mediated. Learning from this perspective is understood as a self-regulated process of resolving inner-cognitive conflicts, which become apparent through concrete experience, collaborate discourse, and reflection. So, from the anthropological view point, the investigator took

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two concepts, scaffolding and ethnography, which were key concepts in this research, taken from everyday settings and ethno-mathematic

On the basis of different constructs of psychology, philosophy and anthropology, the investigator visualized a model of constructivism, which consists all the basic characteristics of each of the constructs mentioned above through key-concepts. So, this model exhibits some key concepts: Action & Reflection which come from cognitive psychology, Viability & Autonomy which come from philosophy, and Scaffolding & Ethnography which come from anthropology.

With necessary alteration of details, the investigator summed up the different theoretical bases of constructivism and identified some of key-concepts as ingredients of constructivism. The investigator defined and used each of these key-concepts in this study as follows:

Psychological Aspect: Learning outcomes can be judge through the activities of "action and reflection" which comes from the opportunity given to children according to their capacities.

(a) Action: In this study, the investigator used this term in relation to the students' activities or courses of actions during classroom teaching while solving a given problem.

(b) Reflection: It is used as a meta-cognition on the actions which the student took while solving, on learning difficulties and misconceptions, on diagnosing errors critically, on assessing and predicting their performances etc. It shapes the knowledge drawn in course of individual action

Philosophical Aspect: This aspect is directly related with the total teaching learning environment created by the mathematics teachers in classroom situation.

(a) Autonomy: Autonomy means a freedom in the environment given to individual student to act and figure out different solutions to a given problem. Student's autonomy in finding the various alternatives depending on their idiosyncrasy has been emphasized.

(b) Viability: Viability refers to the variety of situations used by the teacher that encourages students to come up with more agreed upon solution among the various alternatives. This is an environment provided to the students to think over different answers with corresponding justifications and make consensus to get more viable result. It shapes the results drawn in course of individual learning due to autonomy given to them.

Anthropological Aspect: This aspect has been considered as the process of student learning

through observation, sharing, teaching their peers etc. as well as the contexts that promote such learning which can be assessed.

(a) Scaffolding involves the various sources of student learning within the classroom situation such as peer observation, peer teaching, sharing idea, etc. Through this process students learn within the group and the investigator evaluates the actual development ol child in terms of everyday lives, classroom relationships, teaching decisions, bridges between the discourses etc.

(b) Ethnography: To assess the outcomes of students, only paper-pencil test is not appropriate. Ethnography helps a lot in this case. Ethnography is a methodology which helps us as a resource for understanding classroom as cultures and creates opportunities for increased awareness. Through this the investigator drew information for the classroom activities if learning occurs in the form of scaffolding or by other means.

CONSTRUCTIVIST TEACHING (CT)

Constructivist Teaching refers to a process in which learning environment is created by the teacher to engage students in knowledge construction based on prior knowledge in the group, wherein peer interacts with one another with the help of the materials provided by the teacher and construct new ideas and concepts. Constructivist Teaching is based on integration of major components such as 5 E's Instructional Model and Jigsaw Cooperative Learning

strategy. Basically it follows features of Social Constructivism.

Agarwal and Adepu (2013) conducted a comparatieve study on "effectiveness of Activity Based Learning with traditional teaching method". Randomized pre-test and post-test design was adopted for the study. The study used pre-test and post-test to collect data about achievement of students. The study used mean, SD, 't' test to analyze the data. The study found that; 70 ABL gourp and control group was statistically significant with respect to post-test scores. Group work in ABL class motivated, stumilated the students and incresed their involvment and achievement in class. ABL approach created joyful learning among the 4th class students compare to traditional approach.

Nayar and Senapaty (2011) undertook a study on "the effect of constructivist approach on students' creative ability". The sample consists of 125 class-V students from two different English medium schools in Bhubaneswar city. The Hypotheses was tested at 0.05 level using t-test and ANCOVA. Analysis was carried out using both descriptive and inferential statistics. The findings of study were 1. Creativity scores of constructivist approach group was higher than the control group. There was significant effect of constructivist approach on creativity. 2) Constructivist approach was more effective than traditional approach in enhancing the various dimensions of creativity viz., fluency, flexibility and originality. 3. Constructivist Approach had a significantly higher creative ability in both

fluency and flexibility dimension of CAT but no such different found on originality dimension. 6. Overall Constructivist Approach (CA) is an effective strategy than Traditional Method of Teaching (TMT) for developing fluency, flexibility competency, but not the originality competency

D. Hariharan, 1992, made a study on ‗Attitudes of high school towards homework and their achievement in mathematics' found that girls were higher than boys, urban students were higher than rural students and Private school students were higher than the government school students in their attitude towards their homework. The researcher concluded that the attitudes of high school students towards homework were related to their achievement level in mathematics.

Dr. Ranjana Choudhury & Dhiraj Kumar (2012) in their study on Influence of Attitude Towards Mathematics and Study Habit on the Achievement in Mathematics at the secondary stage found out that the student's attitude towards mathematics affect in the achievement in mathematics. Moreover the achievement of the subject mathematics mostly depends on concept and practice. Attitude towards mathematics depend mainly on the home environment and parent's attitude towards mathematics.

Resnick et al., (1982) studied mathematics anxiety in college students and found that students in lower classes experienced more anxiety than students in higher –level classes. Siddique and Akhtar (1983) studied the relationship between anxiety and academic achievement. Results indicated that highly anxious students performed poorly.

NEED FOR THE STUDY

Learning is an important task of learner. Teacher engage learner in real learning situation to cultivate active learning. But traditional practice like rote learning, repetition and practice may not engage students in active learning. In true sense "Learning takes place within the mind of the learner" (Sivarajan & Faziluddin, 2007). It means, learner internalizes their ideas, views and thoughts in their mind and it is the duty of the teacher to create situation to engage the students in meaning making experience. The emphasis here is on "interaction between the learner and learning environment" (Sivarajan & Faziluddin). Thus, there is a need for using previous experiences or ideas for shaping new knowledge. In reality, active role of students in conceptualization of their learning is important and it is termed as constructivist pedagogy and constructivist movement in education. In this pedagogy, teacher is called constructivist teacher, students are termed as constructive learners and environment is called constructive learning environment. Thus, the approach is a paradigm shift from traditional learning environment into constructivist learning environment. It is also evident from the ideas emphasized by constructivist teaching practitioners as discussed in the integration of mathematics that role play, activity based learning, CAM Model, etc useful in

engaging learner in technology-based constructivist teaching. In this context, there is a real call for Mathematics integration in constructivist practice and gives new framework for learning, teaching as well as for learner centered educational environment. Hence, the present study is conducted to study the impact of Mathematics Based Constructivist Teaching on academic achievement of VIII standard students of Mathematics subject.

LIMITATIONS OF THE STUDY

The study is limited to 9th standard students of government and private school in Bhopal city.

VARIABLES OF THE STUDY

Keeping the problem and objectives, three types of variables i.e. independent variable, dependent variable and moderate variables were considered in the study. Constructivist Teaching (CT) and Mathematics Based Constructivist Teaching (MBCT) and types of school were considered as independent variables, whereas academic achievement in Social Science was the dependent variable. Gender and IQ were termed as moderate variables. Variables of the present study are presented in the following headlines.

Independent Variables

- Constructivist Teaching
- Government and Private School

Dependent Variables

- Academic Achievement in Mathematics Subject

OBJECTIVES OF THE STUDY

- To find out the difference between pre-test and post-test mean scores of mathematics academic achievement of students taught by Constructivist Teaching (CT) with respect to experimental group of government school.
- To find out the difference between pre-test and post-test mean scores of mathematics academic achievement of students taught by Constructivist Teaching (CT) with respect to experimental group of private school.
- To find out the difference between post-test mean scores of mathematics academic achievement of students taught by CT with respect to experimental group of government and private school

METHODOLOGY

In this study, two equivalent group designs were considered. Before the intervention of modules, mid-term examination scores in Mathematics subject were collected. Later, scores were arranged from highest to lowest and students were allotted. Further, 't' test was conducted to see whether Government and private school were significantly equal.

Sample of the study

The study employed purposive sampling technique. The sample comprised of 79 students studying in VIII standard of two schools (Government and Private School) of Bhopal city affiliated to state or CBSE board. Among these 40

students were from government school and remaining 39 students from private school.

DATA ANALYSIS

Normality test

Normality Test for the Sample of Government School

Table 4.1 Normality Test for Distribution of Government School

Groups	N	M	Md n	S D	Mi n	Ma x	Skewness		Kurtosis	
							Sta tist ics	SD. Erro r	Stati stics	SD . Err or
Governm ent School	40	13.95	13	3.1 9	11	21	1.0 27	0.37 4	- 0.231	0.7 3
Private School	39	15.02	15	3.0 6	8	23	0.3 02	0.37 8	- 0.018	0.7 41

Government School sample, skew is 1.027 with a standard error of .374. This gives a measure of

skewness of 1.027/.374= 2.74. Kurtosis is-.231 with a standard error of .733, giving a value of -.231/.733= -0.31. Rule-of-thumb for test of normality is either or both the Skew and Kurtosis value should be within the range of value ± 2. In this case, one of the value i.e. kurtosis is with the bound of value ± 2, whereas the obtained skew value is not much departure from the value 2. This indicate that group one is normally distributed.

Private School, sample skew is .302 with a standard error of .378. This gives a measure of skewness of .302/.378= 0.80. Kurtosis is -.018 with a standard error of .741. This gives measure

kurtosis of -0.18/.741= - 0.024. Rule-of-thumb for normality test is either or both the Skew and Kurtosis value should be within the range of value ± 2. In this case both the values are within the range of ± 2. This indicates that group one is normally distributed

Hypotheses-1: There is no significant difference between pre-test and post-test mean scores of mathematics academic achievement of students taught by Constructivist Teaching (CT) with respect to experimental group of government school.

Table 1

Paired Sample t-Test Results Comparing Pre-Test and Post-Test Mean Scores of mathematics Academic Achievement of CT Group of Government School

Academic achievement	N	M	SD	t- value	p- value
Pre-Test	40	3.2050	1.5098	17.596	0.000
Post-Test	40	17.0202	4.0969		

**0.01 &0.05 level of significance

From the above table it is evident that, they obtained p value is (p<.01) less than the .01 level of significance. Hence, the null hypotheses are rejected. Which means, there is a significant a difference between pre-test (M = 3.20, SD = 1.50) and post-test (M = 17.02, SD = 4.09) mean scores of mathematics academic achievement of students taught by CT with respect to experimental group-1 of government school at .01 level of significance, t(39) = - 17.662, p = .000. It can also be seen that the mean gain score favors post-test, it indicate that, due to impact of

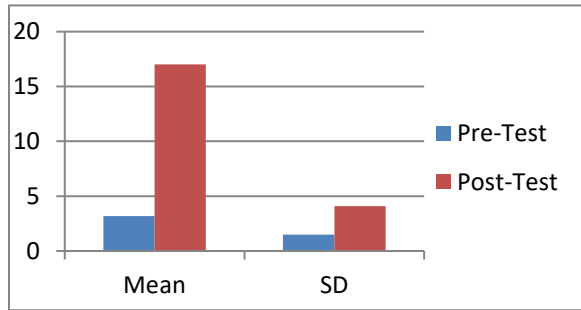intervention of CT, students performed better in thepost-test

Fig-2, Comparing Graph Pre-Test and Post-Test Mean Scores of mathematics Academic Achievement of CT Group of Private School

Hypotheses-2: There is no significant difference between pre-test and post-test mean scores of mathematics academic achievement of students taught by Constructivist Teaching (CT) with respect to experimental group of private school.

Table 2 Paired Sample t-Test Results Comparing Pre-Test and Post-Test Mean Scores of mathematics Academic Achievement of MBCT Group of Private School

Academic achievement	N	M	SD	t-value	p-value
Pre-Test	39	12.2051	2.39714	-11.179 **	0.000
Post-Test	39	18.0256	2.94232		

**0.01 &0.05 level of significance

From table 4.32, it is evident that, they obtained p value is less than the .01 level of significance. Hence, the null hypotheses are rejected and alternative hypotheses are accepted. Which

means, there is a significant difference between pretest (M = 12.2051, SD = 2.39714) and post-test (M = 18.0256, SD = 2.94232) mean scores of mathematics academic achievement of students taught by CT with respect to 196 experimental group-1 of private school at .01 level of significance, t(38) = -11.179, p = .000. It can also be seen that, the mean gain score favors post-test, it indicate that due to impact of intervention of CT the students performed better in the post-test.
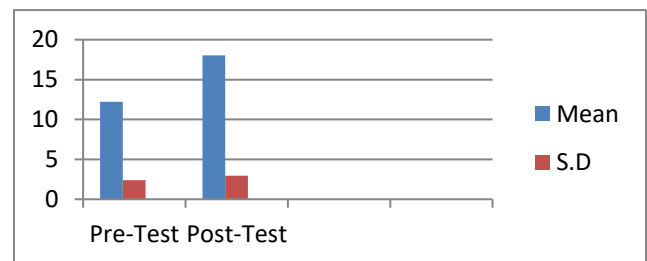

Fig-1, Comparing graph Pre-Test and Post-Test Mean Scores & SD scores of mathematics Academic Achievement of MBCT Group of Private School

Hypotheses-3: There is no significant difference between post-test mean scores of mathematics academic achievement of students taught by CT with respect to experimental group of government and private school

Table 3: Independent Sample t-Test Results Comparing Post-Test Mean Scores of mathematics Academic Achievement of Students Taught by CT With Respect to Government and Private School

Academic achievement	N	M	SD	t-value	p-value
Government School	40	16.9750	4.70944	-1.192**	.237
Private School	39	18.0256	2.94232		

From the above table it is evident that, the obtained p value is (p >.05) higher than the .05 level of significance. Hence, the null hypotheses are accepted. Which means, there is no significant difference between post-test mean scores of mathematics academic achievement of students taught by CT with respect to experimental group-1 of government (M = 16.9750, SD = 4.70944) and private school (M = 18.0256, SD = 2.94232) at .05 level of significance, t (77) = - 1.192, p = .237. Therefore, CT approach found to be equally suitable for government and private school. Thus, post-test mean scores of mathematics academic achievement of students of both the schools found to be equally influenced by the MBCT intervention.
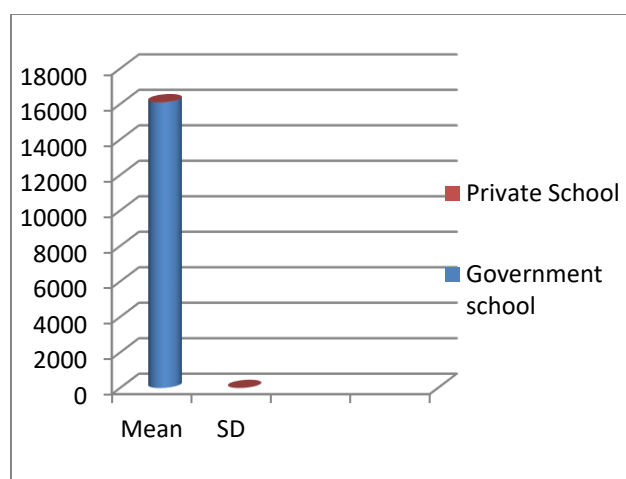

Fig-3 Comparing Graph Post-Test Mean Scores of mathematics Academic Achievement of Students Taught by CT With Respect to Government and Private School.

CONCLUSION

The findings of the present study helped to draw important conclusions. The study found that the students of both CT and MBCT group were performed better in their post-test compare to pre-test in government as well as private school. This means, the treatment CT and TBCT has influenced on the students' academic achievement.

The study also reveals that there was no significant difference in academic achievement of students' taught by CT in government and private school. This means students who taught by CT intervention accomplished same achievement in both the school. Therefore, the study reveals that CT approach is equally useful and suitable for both the school in improving the academic achievement of the students. Thus, types of school as not influenced CT intervention. Whereas with respect to intervention of MBCT, the study found that there was significant different in academic achievement and the students of private school scored higher than the students of government school. It indicates that MBCT is more effective for private school in improving the academic achievement of students in private school compare to government school. Another interesting factor was, student's achievement observed in both the school separately in relation to their pre-test and post-test achievement showed that in both the school MBCT approach was helped them to gain more scores in their post-test. But the mean gain score recorded in the government school is higher than the private school. Therefore, it is a clear evidence of effect of intervention on experimental of government school. It means the students who scored less in their pre-test were able to score more in the post-test due to the intervention.

Thus, it can be concluded that MBCT approach was found to be effective for both the school in academic achievement.

EDUCATIONAL IMPLICATIONS OF THE STUDY

- The study proved that the students of CT and MBCT group performed better in the post-test compare to pre-test in social science subject. Therefore, the teachers of social science subject should use CT and MBCT method to improve the academic achievement of students.

- Performance of students in MBCT group is higher than the students of CT group. Therefore, MBCT approach is more effective than the CT. Thus, mathematics teacher should integrate teaching learning process into constructivist teaching to ensure higher level of academic achievement.

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