e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

EFFECT OF CONSTRUCTIVIST APPROACH ON ACHIEVEMENT IN MATHEMATICS IN RELATION TO PROBLEM SOLVING ABILITY

Jaspreet Kaur*1, Dr. Jaswinder Kaur*2

*1Research Scholar Guru Gobind Singh College Of Education, Guru Kashi University Talwandi Sabo Bathida, India.

*2Assistant Professor Guru Gobind Singh College Of Education, Guru Kashi University Talwandi Sabo Bathida, India.

ABSTRACT

In this paper investigator want to see the effect of constructive approach on achievement in mathematics of IX grade students. When I will teach with constructive approach to the students and with conventional method, then it will leave any impact on achievement in mathematics among IX grade students or not. Moreover investigator wants to see the effect of achievement in mathematics in relation to problem solving ability. For this firstly divide the students in two groups one is control group and other is conventional group. Then further divide this into more sub parts i.e. high problem solving ability and low problem solving ability. In this way investigator want to see the effect of constructivist approach on achievement in mathematics in relation to problem solving ability.

Keywords: Constructivism, Achievement In Mathematics, Problem Solving Ability.

I. INTRODUCTION

1.1 Constructivism:

It is an important learning theory that educators use this approach to help their students to learn. Constructivism is based on the idea that people actively construct or make their own knowledge with their past experiences and ideas. Basically, learners use their previous knowledge as a foundation and build on it with new things that they learn. So everyone's individual experiences make their learning unique to them.

Constructivism is crucial to understand as an educator because it influences the way all of your students learn. Teachers and instructors that understand the constructivist learning theory understand that their students bring their own exclusive experiences to the classroom each day. Their background and earlier knowledge leaves footprints how they are able to learn. Educators are capable to use constructivist learning theory to help their students understand their earlier knowledge. If you are a current or aspiring educator, it's important to get the education and credentials you need. Not only this investigator wants to see the effect of constructive approach on achievement in mathematics in relation to problem solving ability. This guide will tell you more about the constructivist learning theory and how it helps you as a teacher.

1.2 Achievement in Mathematics:

Mathematical Achievement is the proficiency shown by the student in the subject mathematics. Its measures the gain on an achievement test in mathematics. The scores attained by the students in mathematics

1.3 Problem solving ability:

Life is full of problems. Problem solving ability means analysis the problem. These are some steps of problem solving ability

Identify the problem

Collection of relevant data

Formulation the hypotheses

Choose the best hypothesis.

Conclusion

Verification

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

II. REVIEW OF RELATED LITERATURE

International Conference on Mathematics and Mathematics Education (2021):

The research that has been overshadowed in which teaching materials used by students are not all of the material in accordance with the KD. So that the material presented elusive student and as a result students awaiting an explanation by the teacher. Therefore, to create students who are active in learning, students can build their own thoughts or develop his own knowledge is to improve students' reasoning skills learning concept. To improve reasoning skills students need learning tools that make the students can learn and be independent in constructing ideas. And with the development of mathematical learning prangkat based constructivist approach, students can become more active, independent and able to build the knowledge gained

The research that has been overshadowed in which teaching materials used by students are not all of the material in accordance with the KD. So that the material presented elusive student and as a result students awaiting an explanation by the teacher. Therefore, to create students who are active in learning, students can build their own thoughts or develop his own knowledge is to improve students' reasoning skills learning concept. To improve reasoning skills students need learning tools that make the students can learn and be independent in constructing ideas. And with the development of mathematical learning prangkat based constructivist approach, students can become more active, independent and able to build the knowledge gained

This research is a development to produce devices based learning constructivism improve learners' reasoning. Based on an analysis of previous preliminary research, it can be concluded that students are involved in activities less or less build their ideas to be able to build or construct a concept that they can be against math.

(Anderson et al., 2005; Cross Francis, 2015; Yurekli et al., 2020):

Another basic pillar of the program is school content. Quite a few studies show that the time spent on the subject, the parents and the content set by the government determine the educational practice.

(Simplicio et al., 2020):

On many occasions we can hear teachers speaking about the importance of calculus and the procedural mastery of arithmetic operations, relegating those activities that favour reasoning and problem solving. We believe that it is important to disseminate research-based practices in which experimentally dissimilated positive results have been obtained, thus being able to obtain a number of evidence-based practices that allow improving the teaching-learning process and, therefore, the performance of students regarding mathematical competence. Educational practices that are research-validated can constitute a frame of reference to serve as a guide for knowledge transfer. with grace, constructivism oriented teaching techniques are not used to a greater extent.

Nidya et al., (2015); Jerizon et al., (2018) studied that mathematics is a very important subject in regular schooling and it has very strong correlation with human life, mathematics is not only a subject of interest for students, moreover it is very helpful subject to solve day to day life problems.

Simamora etal., (2017) observed that those teachers who explained in their interviews that arithmetic become very difficult for students. The students consider arithmetic very dull and boring subject and are not comfortable with this subject. Further, they described that it may be due to lack of potentialities among students or may be due to lack of appropriate teaching method. Most of the students are not so much interested to take arithmetic as a subject. So teachers should enhance the problem solving ability among the students which will be helpful to increase interest of students in arithmetic.

Bahar and Maker (2015)examined that to solve the mathematical problems is not so easy main purpose of this study is to allow the students to remedy issues in everyday life. The problem solving ability directly deals with scientific attitude. The mathematical problem fixing ability it is not most effective exercise for work. So it is very important to use or implement this technique in day to day life or in mathematical classroom too.

Nayak (2011)tested the effectiveness of problem based totally coaching approach on success in mathematics. Pretest-posttest experimental research layout was used on secondary school students. Significant distinction changed into discovered in mean gain achievement in mathematics rankings of experimental group and control institution. Experimental institution taught via problem primarily based teaching method

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

gained extra than manage group taught via conventional approach. It become revealed that the aggravate based totally coaching strategy enhanced college students' achievement in mathematics.

The to be had overview of literature on the gift have a look at consists of the idea that there is robust co-relation between constructivist approach and mathematical success concluded that the mean achievement score with constructive technique were significantly better than conventional method. The available evaluation of literature on the research pointed out that those who have high trouble solving capacity definitely they are correct mathematical achievers however normally students have low aggravate fixing capacity so their achievement in mathematics is low.

III. TITLE OF THE PROBLEM

Effect Of Constructivist Approach On Achievement In Mathematics In Relation To Problem Solving Ability.

IV. OPERATIONAL DEFINITIONS

4.1 CONSTRUCTIVISM

Constructivism is learner's centred approach in which firstly teacher provides knowledge to the students and after that students will construct their own new knowledge with the help of previous knowledge and experiences. Suppose the teacher afforded knowledge to the students regarding triangles and its types and teacher also described to the students that sum of three angles of a triangle is equal to 180^{o} degrees. After that teacher became passive and he/she wrote the statement on the black board that find third angle of a triangle if one angle of a triangle is 50^{o} and second is 70^{o}.

4.2 ACHIEVEMENT IN MATHEMATICS

Mathematics achievement means the amount of knowledge attained in Mathematics after the instruction or study. It is the score obtained by the students in mathematics test.

4.3 PROBLEM SOLVING ABILITY

Problem solving ability refers to our ability to solve troubles or obstacles with scientific attitude or with step by step course of action. A person may have high problem solving will leave any impact on the achievement in mathematics

V. OBJECTIVES OF THE STUDY

1. To compare the achievements of groups in mathematics will teach through constructivist approach and conventional method of instructions.
2. To compare the achievement of high and low group of students on problem solving ability.
3. To examine the interaction effect of instructional strategy and Problem solving ability on achievement in mathematics.

VI. HYPOTHESES OF STUDY

The study will design the following hypotheses in the study:

1. There exists no significant difference between constructivist approach group and conventional group on achievement in mathematics.
2. There exists no significant difference between high and low Problem solving ability groups on achievement in mathematics.
3. There exist no significant interaction effect of instructional strategy and problem solving ability on achievement in mathematics.

VII. DESIGN

The present study designed to study the "Effect of constructivist approach on achievement in mathematics in relation to Problem solving ability". The present study was experimental in nature. In this study achievement in mathematics is dependent variable. Problem solving ability is independent variables. A post test employed. In order to analyze 2X2 factorial design analysis of variance was used. One group was treated as experimental group and the second group was treated as conventional group. The experimental group was taught through constructive based instruction and conventional group was taught same topics with traditional method of

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

teaching. The study covered two independent variables such as instructional treatment, problem solving ability. The variable of instructional treatment was studied at two levels, namely constructive based instruction and traditional method of teaching. The variable of problem solving ability was studied at two levels such as high and low. The main dependent variable was achievement in Mathematics, which was calculated as the difference in post-test for the subject.

VIII. TOOLS

The following tools will use for collecting data.

1. 12 lesson plan based on constructivist approach from selected topics of mathematics developed by Investigator.
2. A mathematical knowledge test by Dr. Kawaljeet Kaur (2017) employed by Investigator to measure the achievement of students in mathematics.
3. Revised problem solving ability test, PSAT-D by L.N. Dubey(2011) employed.

IX. PROCEDURE

Firstly the Investigator made necessary arrangements with the Principals of schools selected for the experiment. Secondly Investigator divided the students into two groups with randomization. Randomization means that every subject has an equal chance of being assigned. Investigator will write the name of students on the slips of papers and Investigator will put the slips into a bowl and she will pick the slips in front of students. The first designated no of students will place in one group and rest assigned under another group. Thirdly Problem solving ability test administered for classification of students. Fourthly the treatment gave to the students in the form of constructive approach. 12 lesson based on constructivist approach on some topics of mathematics prepared. The students taught through the same topics of mathematics with constructive approach and traditional method to the experimental and conventional group respectively. After the completion of course, achievement test of mathematics administered simultaneously. The experimental and conventional group score compared according to their post test score.

X. STATISTICAL TECHNIQUES

The following statistical techniques will use to test the hypotheses

1. Descriptive statistics technique like mean, standard deviation used to see the nature of distribution of the scores.
2. A three way Analysis of Variance (2x2) employed on the gain achievement scores to test the hypotheses related to the strategies of teaching, problem solving ability.
3. For the significant F- ratio, t-test employed so as to find out the significance difference between means related to different groups and variables.
4. Graphical techniques were used for descriptive analysis and visual perception of the data.

XI. ANALYSIS

Table 11.1

Variables	Experimental group N mean S.D	Conventional group N Mean S.D	Total N Mean S.D
Mean gain score Achievement in mathematics	130 40.8846 11.7	130 35.2308 13.56	260 38.057 12.96

The table that the F-ratio for difference in mean gain achievement scores of different instructional strategies was 2.806, which in comparison to the table value were found highly significant at 0.01 levels of significance. It shows that the experimental and control groups are different beyond the contribution of chance. Hence, the null hypothesis $\mathbf{H_1}$: There exists no significant difference between experimental and control group on achievement in mathematics, was not accepted. The result indicates that the achievement of group taught through constructive approach is much higher than that of traditional teaching strategy in mathematics. In order to

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

probe deeper, the F-ratio was followed by t-test. The values of t–ratio for different combinations of mean gain scores of experimental and control groups for different teaching strategies have been presented in table 11.1.

Table 11.2: t- ratio for various combinations of different instructional strategies

Variable	Experimental Group			Conventional Group		
	N	Mean	SD	N	Mean	SD
	130	40.8846	11.728	130	35.23	13.56
Experimental Group						
N	Mean	SD	---		3.593	
130	40.8846	11.728				
Conventional Group						
N	Mean	SD	---		---	
130	35.23	13.56				

(Critical Value 1.97 at 0.05 level and 2.59 at 0.01 level, df 258)

The mean gain achievement scores of experimental and conventional groups have been depicted through bar diagram in fig 11.2.

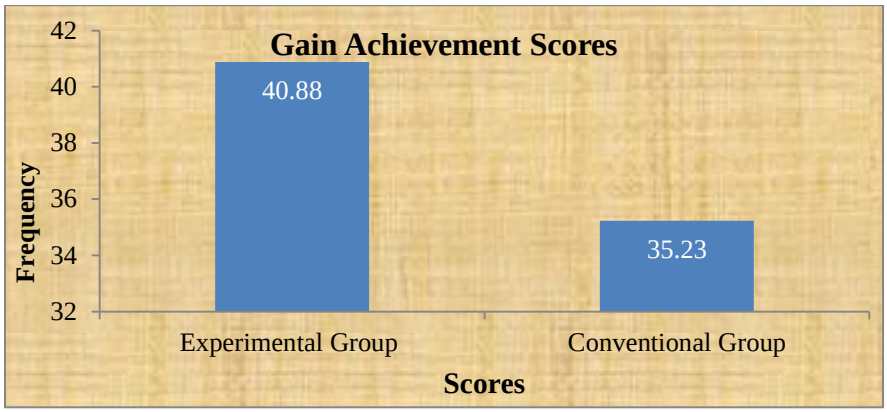

Fig 11.2 2: Bar diagram showing comparison of mean gain achievement scores of experimental and control groups

The table 4.11 and fig 4.12show that the mean gain achievement scores of experimental group- I taught through constructive approach was 40.88,which is higher than the corresponding mean gain score of 35.23. The t-value testing the significance of mean difference on achievement in mathematics of experimental group and conventional group in comparison to the table value was found significant at 0.05 and 0.01 levels of significance. The result indicates that the students taught through constructive approach perform significantly better than that of traditional strategies that is conventional group.

Table A_1 Tests of Between-Subjects Effects

Dependent Variable: achievement in Mathematics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16958.848[a]	11	1541.713	14.380	<.001
Intercept	290034.930	1	290034.93	2705.17	<.001
exp	300.831	1	300.831	2.806	.095

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

p.s.e	63.966	1	63.966	.597	.441
exp * p.s.e	1741.871	1	1741.871	16.247	<.001
Error	26589.286	248	107.215		
Total	420129.000	260			
Corrected Total	43548.135	259			

a. R Squared = .389 (Adjusted R Squared = .362)

- **Problem solving ability (B)**

The table A_1 shows that the F-ratio for difference in mean gain scores of different problem solving ability groups was .597, which in comparison to the table value was found significant at 0.01 levels of significance. Hence, the null hypothesis **H_2: There exists no significant difference between the high and low problem solving ability groups on achievement in mathematics, was accepted.** The result indicates that there exists no significant difference between mean gain achievement scores of high problem solving ability group and low problem solving ability group. To investigate further, F-ratio is followed by t-test. The values of the t-ratio for different combinations have been given in the following table 11.3.

Table 11.4. A summary of descriptive statistics of mean gain achievement scores of experimental and conventional group of high and low problem solving ability.

Variables	Experimental group			Control group			Total		
	N	mean	S.D	N	Mean	S.D	N	Mean	S.D
High problem solving ability	82	42.9512	10.12	46	33.4565	15.20	128	39.531	12.97
Low problem solving ability	48	37.35	13.43	84	36.202	12.55	132	36.6212	12.84
Total sample	130	40.8846	11.72	130	35.23	13.56	260	38.0577	12.96

Table 11.3: t-ratio for different problem solving ability groups on gain achievement scores

Variable	**High problem solving ability**			**Low problem solving ability**		
	N	Mean	SD	N	Mean	SD
	128	39.531	12.97	132	36.62	12.8
High problem solving ability.	----			1.821		
N Mean SD						
128 39.531 12.97						
Low problem solving ability	----			---		
N Mean SD						
132 36.62 12.8						

(Critical Value 1.97 at 0.05 and 2.59 at 0.01 level, df 258)

A bar diagram has been drawn to depict the mean gain achievement scores of high and low problem solving ability groups has been presented in fig 11.3.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

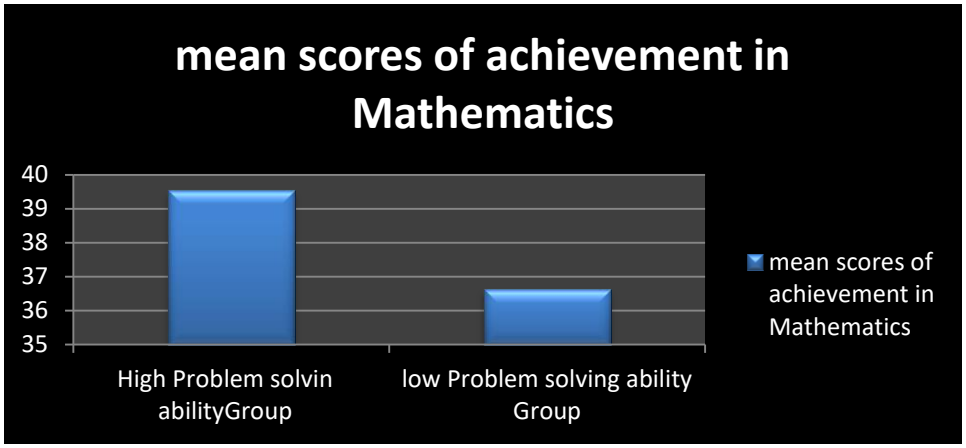

Fig 11.5: Bar diagram showing comparison of gain achievement scores of different problem solving ability groups

Table 11.7: t-ratio for difference in mean gain achievement scores of instructional strategies and different Problem solving ability groups

Variables		Experimental Group		Conventional Group	
		B_1	B_2	B_1	B_2
		Mean SD	Mean SD	Mean SD	Mean SD
		42.95 10.12	37.35 13.43	33.45 15.20	36.20 12.55
Experimental Group	High Problem solving ability N Mean SD 82 42.95 10.12	---	2.692	4.234	3.809
	Low Problem Solving ability N Mean SD 48 37.35 13.43	---	---	1.320	.494
Conventional Group	High Problem solving ability N Mean SD 46 33.45 15.20	---	---	---	---
	Low Problem solving ability N Mean SD 84 36.20 12.55	---	----	1.107	---

It is evident from the table 11.3 and fig 11.5 that gains scores of high problem solving ability group was 39.531, which is higher than the corresponding mean gain scores of 36.621 for the low problem solving ability group. The t-value testing the significance of mean difference of high and low problem solving ability group was 1.821, which in comparison to the table value was found significant at 0.01 levels of significance. Hence, the hypothesis of significant difference was accepted. The result indicates that high problem solving ability group

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

students perform equally than that low problem solving ability group with regard to achievement scores in mathematics.

Interaction between Instructional Strategies and problem solving ability groups (A × B)

Table shows A_1 that the F-ratio for interaction between teaching strategies and problem solving ability group was 16.247, which in comparison to the table value was not found significant at 0.01 levels of significance. The result indicates that different teaching strategies do interact with the problem solving ability group to yield no significant difference in respect of gain achievement scores in mathematics. Hence, the null hypothesis **H_3: There exists no significant interaction effect of instructional strategies and problem solving ability on achievement in mathematics, was rejected.** The result indicates that there is a significant difference in gain scores on achievement in mathematics due to interaction effect of teaching strategies like constructive approach based teaching or traditional methods of teaching and problem solving ability groups.

To ascertain significance of difference among means of various combination groups, t-ratios were calculated which have been shown in table 11.6.

Here B_1 Stands for High Problem solving ability,B_2 Stands for Average Problem solving ability and B_3Stands for Low Problem solving ability

A bar diagram has been drawn to substantiate the results and has been given in fig 11.8

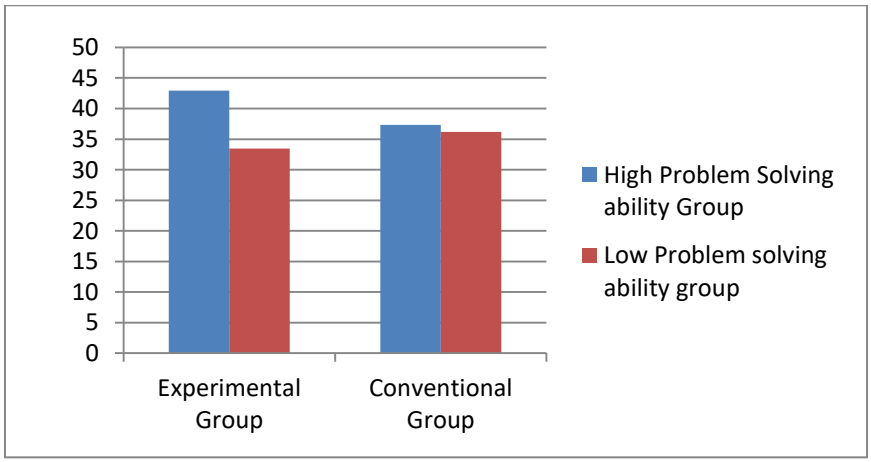

Fig 11.8: Bar diagram showing mean gain achievement scores for different problem solving ability groups of experimental and conventional groups

Table 11.7 and fig 11.8 indicates that high problem solving ability group with mean of 42.95 exhibits higher mean gain scores than low problem solving ability group with mean 37.35 of experimental group The t-ratio for difference in mean gain scores of high and low problem solving ability experimental group was 2.692, which in comparison to the table value ($t_{0.01}$=2.62, df 128) was found significant at 0.01 level of significance. The result indicates that the high problem solving ability of experimental group performs significantly better than that of low problem solving ability of experimental group.

Table 11.7 and fig 11.8 indicates that high problem solving ability group with mean of 42.95 exhibits higher mean gain scores than high problem solving ability group with mean 33.45 of conventional group The t-ratio for difference in mean gain scores of high and high problem solving ability of experimental and conventional group was 4.234, which in comparison to the table value ($t_{0.01}$=2.62, df 126) was found significant at 0.01 level of significance. The result indicates that the high problem solving ability of experimental group performs significantly better than that of high problem solving ability of conventional group.

Table 11.7 and fig 11.8 indicates that high problem solving ability group with mean of 42.95 exhibits higher mean gain scores than low problem solving ability group with mean 36.20 of conventional group The t-ratio for difference in mean gain scores of high and low problem solving ability of experimental and conventional group was 3.809 which in comparison to the table value ($t_{0.01}$=2.60, df 164) was found significant at 0.01 level of significance. The result indicates that the high problem solving ability of experimental group performs significantly better than that of low problem solving ability of conventional group.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

Table 11.7 and fig 11.8 indicates that low problem solving ability group with mean of 37.35 exhibits higher mean gain scores than high problem solving ability group with mean 33.45 of conventional group The t-ratio for difference in mean gain scores of low and high problem solving ability of experimental and conventional group was 1.320 which in comparison to the table value ($t_{0.01}$=2.63, df 92) was not found significant at 0.01 level of significance. The result indicates that there exists no significant difference between low and high problem solving ability of experimental group and conventional group.

Table 11.7 and fig 11.8 indicates that low problem solving ability group with mean of 37.35 exhibits higher mean gain scores than low problem solving ability group with mean 36.20 of conventional group The t-ratio for difference in mean gain scores of low problem solving ability groups of experimental and conventional group was .494 which in comparison to the table value ($t_{0.01}$=2.62, df 130) was not found significant at 0.01 level of significance. The result indicates that there exists no significant difference between low problem solving ability groups of experimental and conventional group.

Table 11.7 and fig 11.8 indicates that low problem solving ability group with mean of 36.20 exhibits higher mean gain scores than high problem solving ability group with mean 33.45 of conventional group The t-ratio for difference in mean gain scores of low and high problem solving ability of experimental and conventional group was 1.107 which in comparison to the table value ($t_{0.01}$=2.62, df 128) was not found significant at 0.01 level of significance. The result indicates that there exists no significant difference between low problem solving ability and high problem solving ability of conventional group.

XII. FINDINGS

1. The present study reveals that the achievement of students in mathematics taught through constructivism was more effective strategy than that of traditional teaching strategy. Hence, the null hypothesis rejected.
2. The result indicates that there exists no significant difference between mean gain achievement scores of high problem solving ability group and low problem solving ability group.
3. The result indicates that there is a significant difference in gain scores on achievement in mathematics due to interaction effect of teaching strategies like constructive approach based teaching, traditional methods of teaching and problem solving ability groups.

- The result indicates that the high problem solving ability of experimental group performs significantly better than that of low problem solving ability of experimental group.
- The result indicates that the high problem solving ability of experimental group performs significantly better than that of high problem solving ability of conventional group.
- The result indicates that the high problem solving ability of experimental group performs significantly better than that of low problem solving ability of conventional group.
- The result indicates that there exists no significant difference between low and high problem solving ability of experimental group and conventional group.
- The result indicates that there exists no significant difference between low problem solving ability groups of experimental and conventional group.
- The result indicates that there exists no significant difference between low problem solving ability and high problem solving ability of conventional group.

XIII. EDUCATIONAL IMPLICATIONS OF THE FINDINGS

FOR THE CHILD

- ✓ Some children failed to show any understanding of certain concepts necessary for meaningful learning in formal method. Constructivism takes care of students prior knowledge. So, they can be benefitted.
- ✓ Constructivism provides opportunity to the students for independent learning. So, it is useful to the students.

FOR THE TEACHER

- ✓ By and large from the same group different individuals appeared to learn by the formal method at different times. So, teacher should be aware, wait and promote necessary actions towards formalization.
- ✓ Teacher should question and insist the students It) explain the answer they give and encourage students to reflect on their answers.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

FOR THE INSTITUTION

- ✓ Since mathematics is a unified subject of different branches constructivism provides integrated approach through which the aim of education, which is preparation for adult life, may be achieved to a great extent.

XIV. CONCLUSION

The following suggestions are for undertaking further studies in the area:

a. The present study was confined to teaching of mathematics. So, it can be conducted to determine the effect of constructive based instruction for other teaching subjects
b. For wider application of the research findings a similar study with more schools from different ecological zone can be conducted.
c. Similar empirical study may be conducted at different levels of schooling (Lower Secondary and senior Secondary Levels).

XV. REFERENCES

[1] National Council of Educational Research and Training (2005). National Curriculum Framework 2005, New Delhi, NCERT.
[2] Sharma santhosh (2005). Constructivist approaches to teaching and learning, Handbook for teachers of secondary stag,. NCERT ,New Delhi
[3] Sridevi, K.V. (2004). Effectiveness of Constructivist approach on students Achievement in Science, Scientific attitude and Perception of Nature of Science at Secondary level, R.I.E, NCERT, Mysore.
[4] Zeigler, John, F.,(2000) Constructivist views of teaching and learning and supervising held by public school teachers and their influence on student achievement in Mathematics. Dissertation Abstracts International, 61(1), 54-A
[5] Constructivism. Background knowledge. Available at: http://curriculum.calstaatela.edu/faculty/psparks/theorists/501 const.html
[6] Constructivist Theory available at: http://www.oltc.edu.au/cp/04c.html
[7] Constructivism as a paradigm for Teaching and Learning. Available at: http://www.wnet.org/wnetschool/concept2class/month2/index.html
[8] Constructivist Learning Design. Available at http://www.prainbow.com/cld/cldp.html