Effectiveness of Mind Mapping Technique on Academic Achievement and Retention in Mathematics of IX Grade Students

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Abstract

The present study was undertaken to study the Effectiveness of Mind mapping technique on Academic Achievement and retention in mathematics of IX grade students. For this investigation, experimental study was conducted. Self made Academic Achievement test, retention test. Mind Maps provided by Punjab govt. under SSA scheme were used as tools for the experiment. Analysis was done according to the scores obtained by the students in the tests. Investigator found that there is a significant difference in achievement of IXth grade students in the tests. Investigator found that there is a significant difference in achievement of IXth grade students taught mind mapping techniques and traditional method. There is no significant difference is in the knowledge level of the students taught mind mapping techniques and traditional method but there is a significant difference is in the knowledge level of the student taught through mind mapping techniques and traditional method but there is a significant difference between comprehensive level and application level. It was also found that there is a significant difference between retention of students taught through mind mapping techniques and traditional method.

KEYWORDS – Mind maps, Mind Mapping techniques, Academic Achievement, retention

INTRODUCTION

The term mathematics as defined in its strict is an abstract science which investigates deductively the conclusion implicit in the elementary conception of spatial numerical relations. It is a science of numbers, quantities and measurement." To Locke, Mathematics was "a way to settle in the mind a habit of reasoning." As we can say that modern civilization is a gift of Mathematics. For scientists, technologies, engineers, doctor, specialists and others, mathematics is there to have catalytic impact on their understanding in order to enrich their performance to serve mankind all over the globe productively and usefully.

The ancient Hindu called Mathematics as Ganita meaning – Science of calculations. To a philosopher- Mathematics is the all types of deductive reasoning.

When man first wanted to answer the question (How many? How much? How big? How long?) etc. he invented arithmetic. Algebra was devised to simplify arithmetical computation. For measurement and discussion about form, "Geometry was invested. To know the position of high mountains and stars trigonometry was invented.

In Greek, Mathematics means "INCLINED TO LEARN."

Mathematics has been recognized as one of the central strings of human intellectual activity throughout the centuries. From the very beginning, mathematics has been a living and growing pursuit. It has its roots in everyday activities and forms the basic structure of our highly advanced technology developments. It also offers opportunities for opening the minds to new lines of:

- Channeling thoughts
- Exhibits connection between things which can be visualized only through the agency of human reason.

The word mathematics has been used in two districts and different senses such that one as method used to solve the problems of quantity, space, order etc. and the second as a set of laws or generalization of truths that are discovered. Mathematics is the branch of science which deals with the study of numbers notations, quantities, measurement and how they affect each other. Majority of pupils feel that mathematics is a difficult subject and it can be understood and followed by exceptionally intelligent students. At present, majority of mathematics teachers follow the traditional methods of instruction in schools. Gestalt psychologists like Tolma and Ausubel have stressed a lot on meaningful learning. Our brain is a sleeping giant. We use a little as 1% of our full potential. Our brain is divided into left and right cortex. If we want to improve our memory, learning and thinking skills we have to use the whole brain. Hence there is a need among the teachers to make use of new and attractive techniques of teaching mathematics for a better understanding and the application of knowledge of mathematics.

MIND MAP

A mind map is a diagram used to represent words, ideas, tasks or other items linked to and arranged around a central key word or idea. Mind map are used to generate, visualize, structure and classify ideas and as an aid to study, organization, problem solving, decision making and writing. Mind map is a powerful accelerated technique, available for both teacher and student. Its inherent simplicity and power comes from its design and rules. Other types of visual-association tools (VAT's for short) such as spider diagrams and bubble diagram are not as effective as mind mapping in assisting thinking, learning and remembering.

Once the student and teacher become competent of the technique, it usually becomes their preferred way of organizing thoughts, planning, preparation and delivery of talks, making notes, and communicating information to themselves and other. It is important that anyone, who teachers mind mapping, understanding the unique capabilities of this specific techniques and has practical hands on experience in its use, so that can coach the students in how to use the tool to its full effectiveness.

MATHEMATICS AND MIND MAPS

A mind map in general is very useful in teaching learning process. Especially in teaching mathematics, the techniques can create wonders in the output.

Mind map in mathematics help in following ways:

- Gather and hold large amount of data.
- Encourage problem solving by seeing new creative pathways
- Enable to increase one's retention
- Achieve higher level of creativity, increased concentration and clear organization of thoughts.
- Improve mental abilities.
- Remember names, facts, figure, and formulae etc. using memory techniques.
- Recall what is learned during revision and summarization.

ACADEMIC ACHIEVEMENT

Modern society is achievement oriented. Academic Achievement is the point and center of education growth and development. It is the most important goal of education. Despite many varied statements about aims of education, the academic achievement of people continues to be the primary and the most important goal of education.

The term "Academic" has been derived from the term "Academy" which means "A school where special types of instruction are imparted".

Academic achievement depends upon a number of factors like personal, which in turn determines the failure and success of a student. Thus it will be of immense interest and imported for research to know there factors which are contributing to the academic achievement.

RETENTION

According to ZANE L. BERGE, "Retention is a continued student participation in a learning event to completion, which in HE could be a course, program, institution or a system."

According to GREG FROST, "Retention or long term memory can be thought of as a database where all the information that you have learned is kept."

OBJECTIVES OF THE STUDY

The followings are the objectives laid down for the present study:

1. To compare the mean of achievement scores in mathematics of the students taught through mind mapping techniques and traditional method.
2. To study the effectiveness of mind mapping techniques and traditional

method on student at three levels of objectives i.e. knowledge, comprehension and application level.

3. To compare the retention scores of students exposed to mind mapping techniques and traditional method.
4. To study the effect of mind mapping techniques and traditional method on student at three levels of objectives i.e. knowledge, comprehension and application level on retention scores.

HYPOTHESES

1. There is no significant difference in the mean of achievement scores in mathematics of the students taught through mind mapping techniques and traditional method.
2. There is no significant difference in the effectiveness of mind mapping techniques and traditional method on students at three levels of objectives i.e. knowledge, comprehension and application levels of objectives.
3. There is no significant difference in the retention scores of students exposed to mind mapping techniques and traditional method.
4. There is no significant difference in the effects of mind mapping techniques and traditional method on student at three levels of objectives i.e. knowledge, comprehension and application level on retention scores.

Methodology: -

Tool used: In present study, following tools were employed to collect data:

Content validation Test and Retention test framed by the investigator at three levels of objectives i.e. knowledge, comprehension and application.

Mind maps provided by Punjab govt. to every govt.
school under SSA scheme. Sketch figures.

SAMPLE

The representation of the population is called sample. Thus sample is a small representation of a larger whole. For sampling, investigator chose **convenient sampling techniques** to collect the data, 47 students of IX Class were taken as sample.

DESIGN OF THE STUDY

Experimental method of research was employed for the present study. The t-test was applied to find out the significance of difference between means of different categories and determining coefficient of correlation respectively.

It is not possible to collect the data from all the members of the population and the investigator therefore, resorted to sampling techniques. It is a technique by which a relatively small number of individual or measure of individual, object of events is

selected and analyzed in order to find out something about the entire population, saves time and energy, permits measurement of greater scope or produces greater precision and accuracy.

Analysis and Interpretation of Data

To investigate the significance of difference between the means, if any, of on learning outcome of experimental group and control group of secondary school students was assessed in terms of their scores in the tests in these variables, t-test was employed.

Table 1 Significance of the Difference between Means of Scores of Pre-test in Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique and Traditional Method (N = 47)

S. No	Group	N	Mean	S.D	SE_M	t-value
1.	Mind mapping technique	24	14.73	4.58	0.93	1.30
2.	Traditional method	23	12.96	4.77	0.99	

Table 1 revealed that the mean scores of pre-test in academic achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 14.73 and 12.96 respectively and their standard deviation as 4.58 and 4.77 respectively. The t-ratio was calculated as 1.30 which us not significant at .05 level confidence. This revealed that no significant difference exists between scores of pre-test in achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that IXth grade students taught through mind mapping technique and traditional method were equal in their achievement in mathematics before conducting the experiment.

Table 2 Significance of the Difference between Means of Scores of Pre-test of Achievement at Knowledge, Comprehensive and Application levels of IXth grade students taught through Mind Mapping Technique and Traditional Method (N = 47)

Level	Group	N	Mean	S.D	SE_M	t-value
Knowledge	**Mind mapping technique**	**24**				**0.68**
	Traditional method	**23**	**4.10**	**2.05**	**0.42**	
Comprehensive	**Mind mapping**	**24**	**3.70**	**2.10**	**0.44**	**0.00**

	Traditional method	**23**	**5.52**	**2.65**	**0.54**	
Application	**Mind mapping**	**24**	**5.10**	**3.75**	**0.77**	**1.28**
	Traditional method	**23**	**3.72**	**3.69**	**0.77**	

Table 2 revealed that mean scores of pre-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 4.10 and 3.70 respectively and their standard deviation as 2.05 and 2.10 respectively. The t-ratio was calculated as 0.68 which is not significant at .05 level of confidence. This revealed that no significant difference exits between scores of pre-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that IXth grade students taught through mind mapping technique and traditional method were equal in their knowledge level of achievement in mathematics before conducting the experiment.

The mean of pre-test in comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 5.52 and 5.52 respectively and their standard deviation as
2.65 and 3.17 respectively. The t-ratio was calculated as 0.00 which is not significance at .05 level of confidence. This revealed that no significant different exists between scores of pre-test in comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that IXth grade students taught through mind mapping technique and traditional method were equal in their comprehension level of achievement in mathematics before conducting the experiment.

The mean scores of pre-test in application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 5.10 and 3.71 respectively and their standard deviation as
3.75 and 3.69 respectively. The ratio was calculated as 1.28 which is not significant at .05 level of confidence. This revealed that no significant difference exists between scores of pre-test in application level achievement in mathematics of IXth grade students taught trough mind mapping technique and traditional method. Hence it may be concluded that IXth grade students taught through mind mapping technique and traditional method were equal in their comprehension level of achievement in mathematics before conducting the experiment.

Table 3 Significance of the Different between Means of Scores of Pre-test and Post-Test in Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique (N=24)

S. No	Group	N	Mean	S.D	SE_M	r	t-value
1.	**Pre-test**	24	14.73	4.58	0.93	0.51	21.228*

2.	**Post-test**	24	32.56	3.59	0.73		

****Significance at 0.01 level**

Table 3 revealed that the mean scores of pre-test and post-test of academic achievement of IXth grades students taught through mind mapping technique as 14.73 and 32.56 respectively and their standard deviation as 4.58 and 3.59 respectively. The t-ratio was calculated as 21.22 which is significant at .01 level of confidence achievement of IXth grade students taught through mind mapping technique.

Table 3 Significance of the Different between Means of Scores of Pre-test and Post-Test in Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique (N=24)

Level	Group	N	Mean	S.D	SEM	r	t-value
Knowledge	**Pre-test**	**24**	**4.10**	**2.05**	**0.42**	**0.48**	**6.12****
	Post-test	**24**	**6.42**	**1.44**	**0.29**		
Comprehensive	**Pre-test**	**24**	**5.52**	**2.65**	**0.54**	**0.38**	**9.79****
	Post-test	**24**	**11.35**	**2.59**	**0.53**		
Application	**Pre-test**	**24**	**5.10**	**3.75**	**0.77**	**0.23**	**14.05****
	Post-test	**24**	**14.67**	**2.17**	**0.44**		

****Significance at 0.01 level**

Table 4 revealed that the mean scores of pre-test and post-test of knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique as 4.10 and 6.42 respectively and their standard deviation as 2.05 and 1.44 respectively. The t-ratio was calculated as 6.12 which is significant at .01 level of confidence. This revealed that a significant difference exits between scores of pre-test and post-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique.

The mean scores of pre-test and post-test of knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique as 5.52 and 1.35 respectively and their standard deviation as 2.65 and 2.59 respectively. The t-ratio was calculated as 9.79 which is significant at .01 level of confidence. This revealed that a significant difference exits between scores of pre-test and post-test of comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique.

The mean scores of pre-test and post-test of knowledge level of achievement in

mathematics of IXth grade students taught through mind mapping technique as 5.10 and 14.67 respectively and their standard deviation as 3.75 and 2.17 respectively. The t-ratio was calculated as 6.12 which is significant at .01 level of confidence. This revealed that a significant difference exits between scores of pre-test and post-test of application level of achievement in mathematics of IXth grade students taught through mind mapping technique.

As a significant difference was found between all the three levels of objective i.e. knowledge, comprehension and application with mean scores of post test higher than pre test in all these three cases, hence it may be concluded that there exists a significant effect of mind mapping on retention scores of students in all three levels of objective i.e. knowledge, comprehension and application

Table 5 Significance of the Different between Means of Scores of Post-test in Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique and Traditional Method (N=47)

S. No	Group	N	Mean	S.D	SEM	t-value
1.	**Mind mapping technique**	24	32.56	3.59	0.73	8.18**
2.	**Traditional method**	23	22.80	4.55	0.95	

****Significant at 0.01 level**

Table 5 revealed that the mean scores of post-test in academic achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 32.56 and 22.80 respectively and their standard deviation as 3.59 and 4.55 respectively. The t-ratio was calculated as 8.18 which is significant at .01 level confidence. This revealed that no significant difference exists between scores of post-test in achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that there exist a significant difference in achievement of IXth grade students taught through mind mapping technique and traditional method.

The hypothesis 1 stating that there no significant difference in achievement of IXth grade students taught through mind mapping and traditional method is rejected.

Moreover as the mean score of academic achievement of IXth grade students taught traditional method, hence it may also be concluded that the students taught through mind mapping technique had higher academic achievement than the students taught through traditional method.

Table 6 Significance of the Different between Means of Scores of Post-test in Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique and Traditional Method (N=47)

Level	Group	N	Mean	S.D	SEM	t-value
Knowledge	Mind mapping technique	24	6.42	1.44	0.29	0.50
	Traditional method	23	6.20	1.58	0.33	
Comprehensive	Mind mapping	24	11.35	2.59	0.53	5.90**
	Traditional method	23	5.50	4.07	0.85	
Application	Mind mapping	24	11.67	2.17	0.44	4.20**
	Traditional method	23	11.04	3.60	0.75	

****Significant at 0.01 level**

Table 6 revealed that the mean scores of post-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 6.42 and 1.58 respectively and their standard deviation as 1.44 and 1.58 respectively. The t-ratio was calculated as 0.50 which is not significant at .05 level of confidence. This revealed that no significant difference exits between scores of post-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that IXth grade students taught through mind mapping technique and traditional method were equal in their knowledge level of achievement in mathematics before conducting the experiment.

The mean scores of post-test in comprehensive level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 11.35 and 5.50 respectively and their standard deviation as 2.59 and 4.07 respectively. The t-ratio was calculated as 5.90 which is significant at .01 level of confidence. This revealed that no significant difference exits between scores of post-test in knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that there exist a significant difference in IXth grade students taught through mind mapping technique and traditional method in comprehensive level of achievement in mathematics.

Moreover as the mean score of academic achievement in comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique is higher than that of the students taught traditional method, hence it may also be concluded that the students taught through mind mapping techniques had higher in comprehension level of achievement in mathematics than the students taught through

traditional method.

The mean scores of post-test in application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 14.67 and 11.04 respectively and their standard deviation as 2.17 and 3.60 respectively. The t-ratio was calculated as 4.20 which is significant at .01 level of confidence. This revealed that no significant difference exits between scores of post-test in application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method. Hence it may be concluded that there exist a significant difference in IXth grade students taught through mind mapping technique and traditional method in application level of achievement in mathematics.

Moreover as the mean score of academic achievement in application level of achievement in mathematics of IXth grade students taught through mind mapping technique is higher than that of the students taught traditional method, hence it may also be concluded that the students taught through mind mapping techniques had higher in application level of achievement in mathematics than the students taught through traditional method.

Hence hypothesis 2 stating that there exists no significant difference in the three levels of objectives i.e. achievement at knowledge, comprehension and application level of IXth grade students taught through mind mapping technique and traditional method is partially rejected.

Table 7 Significance of the Different between Means of Scores of Gain Scores Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique and Traditional Method (N=47)

(N=50)

S. No	Group	N	Mean	S.D	SEM	t-value
1.	**Mind mapping technique**	24	17.83	4.12	0.84	5.59**
2.	**Traditional method**	23	9.85	5.60	1.17	

Significant at 0.01 levels

Table 7 revealed that the mean scores of gain scores academic achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 17.83 and 9.85 respectively and their standard deviation as 4.12 and 5.60 respectively. The t-ratio was calculated as 5.59 which is significant at .05 level of confidence. This revealed that a significant difference exits between gain scores of academic achievement in mathematics of IXth grade students taught through

mind mapping technique and traditional method which shows that there exists a significant difference between the academic achievements in mathematics of IXth grade students taught through mind mapping techniques and traditional method.

Therefore the hypothesis 3 stating that there exist no significant effect in achievement in mathematics of IXth grade students taught through mind mapping technique method stands rejected.

Table 8 Significance of the Different between Means of Scores of Gain Scores Academic Achievement in mathematics of IXth grade students taught through Mind Mapping Technique and Traditional Method (N=47)

Level	Group	N	Mean	S.D	SEM	t-value
Knowledge	Mind mapping technique	24	2.31	1.85	0.38	0.30
	Traditional method	23	2.50	2.43	0.51	
Comprehensive	Mind mapping	24	5.83	2.92	0.60	5.02**
	Traditional method	23	0.02	4.88	1.02	
Application	Mind mapping	24	9.56	3.89	0.79	1.79
	Traditional method	23	7.33	4.65	0.97	

Significance at 0.01 level

Table 8 revealed that the mean scores of gain scores knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 2.31 and 2.50 respectively and their standard deviation as 1.85 and 2.43 respectively. The t-ratio was calculated as 0.30 which is not significant at .05 level of confidence. This revealed that a significant difference exits between gain scores of knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method which shows that there exists a Significant difference between the knowledge level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method.

The mean of gain scores of comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 5.83 and 0.02 respectively6 and their standard deviation as 2.92 and 4.88 respectively. The t-ratio was calculated as 5.02 which is significant at .01 level of confidence. This revealed that a significant difference exists between gain scores of comprehension level of achievement in mathematics of IXth grade students taught through mind mapping

technique and traditional method which shows that there exists a significant difference between the comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method.

The mean of gain scores of application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method as 9.56 and 7.33 respectively and their standard deviation as 3.89 and
4.65 respectively. The t-ratio was calculated as 1.79 which is not significant at .05 level of confidence. This revealed that no significant difference exists between gain scores of application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method which shows that the exist a significant difference between the application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method.

As the significant difference exist only between gain scores in the comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional methods and no significant difference was found between gain scores in the knowledge and application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method, thus the hypothesis 4 stating that there exists no significant difference in achievement in mathematics at the three levels of objectives i.e knowledge, comprehension and application levels of objectives of IXth grade students taught through mind mapping technique and traditional method stands partially rejected.

CONCLUSIONS

This study revealed that there exist a significant difference in achievement of IXth grade students taught through mind mapping technique and traditional method. It may also be concluded that the students taught through mind mapping technique had higher in comprehension level of achievement in mathematics than the students taught though traditional method. The students taught through mind mapping technique also had higher application level of achievement in mathematics than the students taught through traditional method. It also revealed that the significant difference exist only between retention scores in the comprehension level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method and no significant difference was found between retention scores in the knowledge and application level of achievement in mathematics of IXth grade students taught through mind mapping technique and traditional method.

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