

# Visual Mapping Program is effective for mathematics achievement of ix std students.

Piyali Ghosh<sup>1</sup>, Prof Dr. Avinash Bhandarkar<sup>2</sup>

<sup>1</sup>Research Scholar, Vidya Pratishthan (Maharashtra) Sanchlit College of Education, Savitribai Phule Pune University

<sup>2</sup>Prof, Vidya Pratishthan (Maharashtra) Sanchlit College of Education, Ahmednagar

---

## ABSTRACT

This study was designed to determine the effectiveness of a visual mapping program on the mathematics achievement of class 9<sup>th</sup> std. students of Bengali medium west Bengal secondary board of education school of Howrah district, West Bengal state. A pre-achievement test & post-achievement test were equivalent to the experimental & control group, quasi-experimental research design for the two groups was adopted. Here three hypothesis was tested between 0.05 and 0.01 level of significance. The sample of the study was made of 26 students for the experimental and 26 students for the control group from class 9<sup>th</sup> std. on the academic year 2022 from Islampur high school of Howrah district, West Bengal. The researcher made and standardized mathematics achievement test was used for data collection. Visual mapping lesson plans were prepared by the researcher. The achievement test was validated by four experts in mathematics education subjects & the reliability coefficient was found to be 0.98 using the Pearson correlation coefficient test. The hypothesis was tested by using a t-test & objectives were answered using Mean. The findings were the difference between the means of the control group & experimental group and also between the pre-achievement and post-achievement tests of the experimental group were found. Thus, it can be inferred that a visual mapping program is more effective than the traditional teaching method by increasing students' achievement in mathematics.

**Key Words:** Visual mapping program, mathematics achievement.

---

## INTRODUCTION

Mathematics is a living and prosperous branch of our culture. India has a protracted record of teaching and learning mathematics & getting to know mathematics back to the Vedic age (1500 to 2000 BC). Mathematics education is a subject of teaching and learning mathematics, as well as integrated research of scholars, in contemporary education. Mathematics also is a core subject in high schools. Mathematical understanding and knowledge perform a vital role in informing the contents of different school subjects which include science, social studies, and even art and music. Kothari commission has explained that "Mathematics should be made a compulsory subject for students of 1<sup>st</sup> to 10<sup>th</sup> std. as a part of general education."

The teacher has experienced a great deal of difficulty in the classroom teaching what happens in the minds of the students and what one student thinks, not to mention that all, or most of the students in the general class think about the concept or problem. Problem-solving is a key mathematical goal and one of the greatest goals in mathematics education in the twentieth century. So, this paper introduces a new concept – the "visual maps" – that might assist researchers, and ultimately teachers, to be in a better position than they are at present to be able to identify the mental connections that a student may or may not be making and also helps learners to understand the concept and develop memory.

Mapping is the creation of maps (a symbolic depiction emphasizing relationships between elements), a graphic symbolic representation of the significant features of a part. There are various types of mapping techniques like-gene mapping, brain mapping, data mapping, mind mapping, concept mapping, thinking mapping, argument mapping, texture mapping, spiritual mapping, robotic mapping, and Venn diagram.

Visual mapping is a visual aid to images & verbal visualization approach to a picture that can guide the memory journey and provide easy organizing facts and ideas that can be used as an alternative to understanding & solving mathematical problems. Visual representation of personal information formed on a particular topic. This display takes the form of a limited graph with notes that show mathematical concepts and links (lines or arcs) and represent the relationships between them. The real power of Visual Mapping lies in the way we allow ourselves to think

through the view. Visual Map design simulates how methods are developed when new or existing information is transferred between brain cells i.e., it acts like a brain. Creating visual maps makes it easy and quick to build new connections and memory. So, if we want to build a more, better plan, solve complex problems, save time, communicate better, speed up our learning, improve memory, or do better around, Visual Maps is a great way to do just that.

Mathematical achievement is a skill that students demonstrate in mathematics. Measuring points on a mathematical achievement test. In mathematics, the achievement is the understanding of the mind, that is, the understanding of mathematical concepts and the knowledge gained from the lesson.

**Need and importance of the study:**

If we want to make mathematics more visualize then we use the visual mapping strategy which provides a teacher and students a visual road map during the learning process. So many researchers use this visual concept by using concept and mind mapping, argument mapping, and thinking mapping in mathematics teaching. Astrid Brinkmann in his research says that knowledge maps are tools for the structure of mathematics. Visual Mapping is a creative process of content planning and can be used for lesson planning, critical reading and creative thinking, critical thinking, individual and group work, developing a good mathematical attitude, and interest, as well as promoting critical thinking and problem-solving. In mathematics, there are so many new concepts, theories, and principles introduced to suit the needs raised by higher education. But students find it difficult to grasp the concepts, the academic achievement rate is low, and the damage is huge. Research is therefore needed to develop an effective strategy to overcome the difficulties and provide the right solution to create interest, improve comprehension, and improve student achievement in mathematics.

**STATEMENT OF THE PROBLEM**

To develop and find out the effectiveness of the Visual Mapping Program on achievement in the mathematics of class 9th of west Bengal board of secondary education (WBBSE) in Bengali medium high school students of Howrah district in West Bengal.

**Visual Mapping**

**Conceptual definition**

Visual mapping is a visual aid to an image that can guide the memory journey and provide easy editing of facts and ideas that can be used as an alternative to understanding and solving mathematical problems (Astrid Brinkman)

**Operational definition**

Visual presentation of knowledge is proposed as having the potential to enhance student learning by providing students with a wide range of presentations (graphs, diagrams, and maps) of knowledge.

**Achievement**

**Conceptual definition**

The process or fact of achieving something. (Dictionary)

**Operational definition**

Here the term is to describe the performance of the students in mathematical subjects of the school curriculum. Here we conduct the achievement test to measure the learning outcome of students.

- Objective:**
1. To develop visual mapping (concept maps, mind maps, thinking maps) for teaching mathematics.
  2. To study the effectiveness of the visual mapping program on achievement in mathematics teaching over traditional teaching based on sex.

- Hypothesis:**
1. There is no significant difference in pre & post-achievement results of the control group and the experimental group.
  2. There is no significant difference in pre & post-achievement test results of the experimental group.
  3. There is no significant difference in pre & post-achievement test results of experimental group boys and experimental group girls.

Types of variables	Variables
Independent	Visual mapping program
Dependent	Achievement
Extraneous	School environment & attitude of students, age, sex topics, time duration, tests, medium of instruction

**Method:**

- **Design:** Two-group quasi-experimental design.
- **Nature of the school:** West Bengal board of secondary education (WBBSE) in Bengali medium high school students of Howrah district in West Bengal
- **Grade level:** High school students of class 9<sup>th</sup> standard.
- **Subject:** Mathematics

**Population:** All students studying in class 9<sup>th</sup> of west Bengal board of secondary education of Howrah district.

**Sample:** The current study was conducted with a sample of 52 students studying in class 9<sup>th</sup> of Islampur Adarsha school of Howrah district in West Bengal.

**Research Tools:** 1. Visual mapping (developed by the researcher)  
2. Achievement pre and post-test in mathematics subject. (Developed and standardized)

**Statistical tools:** Mean, Median, t-test.

**Review of related literature:**

**Héctor C. Santiago, OD, Ph.D., FAAO(2011)** in their study focusing on 'Visual Mapping to enhance Learning and Critical Thinking Skills' found that visual mapping allows the reader to visualize, analyze, compile and share ideas. . This paper reviews mapping tools that are useful for discussing and photographing a thought process (mind map), exploring knowledge structure (concept map), developing environments, arguments, conclusions about conflict (argument maps), and assessing student thinking. process (@Thinking Maps), seeks the relationship between dynamics (general systems thinking) and the development of simulation models (system dynamic). This paper also provides evidence of the effectiveness of these tools in promoting memory, comprehension, and critical thinking skills in general.

**Sukanya Appoji, Dr. H. M. Shailaja (2017)** conducted a study titled 'Effect of Concept Mapping on Academic Achievement of Students in Physics in Relation to Gender' objective research to study the differences between pre-test and post-test Academic. the achievement of girls and male students in the Control group and the experimental group in physics. The current research sample includes 40 students from the Control group and 40 students from the Assessment team from the VIII Physics topic typical of the Belagavi region. Each group consists of 22 female students and 18 male students. The study is of a Quasi-Experimental type in which both control and experimental groups are considered.

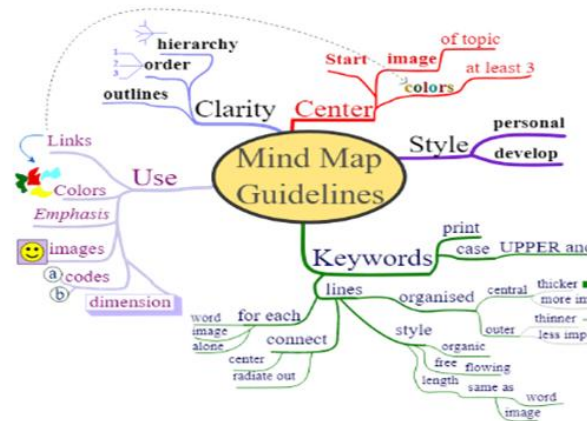
**R. Manikandan P. Murugaraju, Dr. A. Edward William Benjamin (2020)** researched 'MIND MAPPING AND ACHIEVEMENT MATHEMATICS OF THE HIGHER SECONDARY SCHOOL STUDENTS' and learned that the main goal of teaching and learning mathematics is to motivate and make students realize that mathematics is an interesting subject. The current study aims to find a link between the mind map and achievement in mathematics for higher secondary school students. Fifty-five higher secondary school students were randomly selected as samples. A descriptive survey methodology was adopted in the study. Data were collected using experiments on mind mapping. The description was drawn based on the findings. The ability to draw the mind map of higher secondary school students was found to be measurable and there was a positive correlation between mind mapping and mathematical achievement.

**Dr. Md. Aynul Hoque(2018)** in his paper entitled 'INCORPORATING THINKING MAPS IN TEACHING HISTORY' investigates that history is one of the strongest subjects of social science and its importance in the field of free arts is unquestionable. It is one teaching method that reminds us of our past values, customs, traditions, etc. real sources of our pride. Given the importance of History and the desire to make it more focused on students and in line with modern aspirations, we as educators should pay close attention to the use of new teaching methods, so that the lesson can be built on the imprint in students' minds and the realization of practical learning aids. Thinking maps can help in many ways to present thought-provoking lessons and reduce boredom, as well as topic harmony. In this article, attempts have been made to discuss different types of thinking maps and how these can be used to teach History through relevant examples. This paper will be of great help to teachers to be equipped with this new approach and may be intended to use thinking maps in teaching History.

**Table 1.1 Development of Visual mapping:**

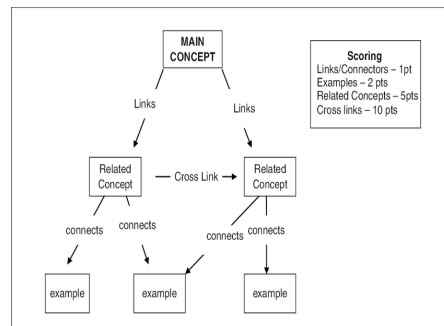
There are 4 steps to creating mind maps:

- start with the main idea
- put branches in the main idea
- Explore topics by adding additional branches
- Add pictures & colours



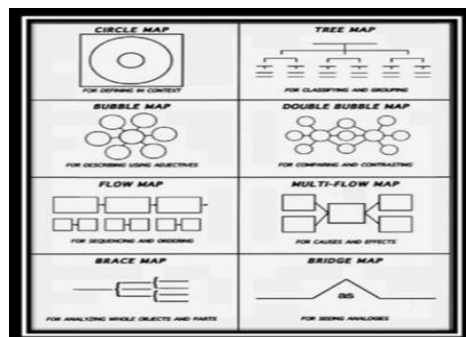
There are 5 steps to creating concept maps:

- Create the main concept [mindmapmaker.org](http://mindmapmaker.org)
- Identify the key concept
- Subordinate concepts
- Organize shapes and line [researchgate.net](http://researchgate.net)
- Compare representation to the text



These eight thinking maps are based on the eight basic cognitive processes: -

1. circle map for defining in context
2. bubble map for description and characterization
3. double bubble map for comparison and contrast
4. treemap for the theme, main idea, and details
5. brace map for physical parts
6. flow map for sequence
7. multi-flow map for problem-solution and conflict and
8. bridge map- comparison by analogy (Hyerle, 2011).



**Implementation:** Two groups were selected based on their prior knowledge and previous achievement test results. The achievement test was used as a pre-test for both control and experimental groups. There are several concept maps and mind maps available in class 9 mathematics subjects but the investigator developed new maps in 4 chapters of mathematics like 'real numbers', 'indices', 'Area of a circle', 'logarithm' for class 9<sup>th</sup> students. The investigator has taught the experimental group by visual mapping the mathematics of selected 4 chapters and the control group in traditional teaching. The students of the experimental group constructed visual mapping individually in groups. After implementation of the visual mapping program for about 1 week for the experimental

group and traditional teaching for the control group, the post-achievement test was used for both control and experimental groups.

**Data Analysis and Interpretation:**

**Table-1: Experimental and control group in pre- achievement test**

Group type	N	Mean( $\bar{x}$ )	Std. Deviation	df	t-value	Tabulated value of "t" at 0.05 level	Tabulated value of "t" at 0.01 level
Experimental	26	35.04	2.11	50	0.0379	2.0	2.66
Control	26	35	4.72				

From the above data in Table -1 the value of "t" is 0.0379 which was found statistically insignificant at both 0.05 and 0.01 levels for the degree of freedom 50. A very small difference was found in mean scores. It means that the two groups of students were at the same level at the starting.

**Table-2: Difference between Experimental and control groups on post-achievement test**

Group type	N	Mean( $\bar{x}$ )	Std. Deviation	df	t-value	Tabulated value of "t" at 0.05 level	Tabulated value of "t" at 0.01 level
Experimental	26	41.27	2.78	50	7.4839	2.0	2.66
Control	26	28.92	7.94				

From the above data in Table -2 the value of "t" is 7.4839 which was found to be significant at both 0.05 and 0.01 levels for the degree of freedom 50. The difference was observed between the two groups concerning the post-test achievement of total students in mathematics. By rejecting the null hypothesis, it claims to be accepted the alternative hypothesis. So, the students in the experimental group got better than the control group in the post-achievement test.

**Table-3: Pre-achievement test and post-achievement test of the experimental group.**

Group type	N	Mean( $\bar{x}$ )	Std. Deviation	df	t-value	Tabulated value of "t" at 0.05 level	Tabulated value of "t" at 0.01 level
Experimental(pre)	26	35.04	2.11	50	9.1098	2.0	2.66
Experimental(post)	26	41.27	2.78				

In Table -3 the value of "t" is 9.1098 which was found to be significant at both 0.05 and 0.01 levels for the degree of freedom 50. There was a significant difference between the experimental group of pre-achievement and post-achievement scores in mathematics. Hence, it claims that the null hypothesis is rejected and the alternative hypothesis is accepted. So, the students in the experimental group scored on the post-achievement test better than on the pre-achievement test.

**Table-4: Comparison of Boys of Experimental group and Girls of Experimental group on the pre-achievement test**

Group type	N	Mean( $\bar{x}$ )	Std. Deviation	df	t-value	Tabulated value of "t" at 0.05 level	Tabulated value of "t" at 0.01 level
Boys	13	35	2.71	24	0.0912	2.06	2.79
Girls	13	35.08	1.38				

In Table -4 the value of "t" is 0.0912 which was found not to be significant at both 0.05 and 0.01 levels for the degree of freedom 24. No significant difference is observed between Boys and Girls of experimental groups

concerning pre-test scores of total students in mathematics. A very small difference was found in the mean scores which are 0.08. It means that the two groups of students are at the same level at the starting.

**Table-5: Comparison of Boys of Experimental group and Girls of Experimental group on the post-achievement test.**

Group type	N	Mean( $\bar{x}$ )	Std. Deviation	df	t-value	Tabulated value of "t" at 0.05 level	Tabulated value of "t" at 0.01 level
Boys	13	43.08	2.25	24	4.3421	2.06	2.79
Girls	13	39.46	1.98				

In Table -4 the value of "t" is 4.3421 which was found to be significant at both 0.05 and 0.01 levels for the degree of freedom 24. There was a significant difference between the boys and girls of experimental groups concerning post-test scores of total students in mathematics. Hence, we accepted the alternative hypothesis by rejecting the null hypothesis. So, the boys in the experimental group are better than the girls in the experimental group in scores of the post-achievement test.

### FINDINGS

Based on the above analysis findings are:

- The two groups (experimental and control) of students are at the same level at the starting according to their pre-achievement test.
- Experimental groups' post-achievement results are significantly higher than the control group's post-achievement results.
- The post-achievement test results are higher than the pre-achievement test result of the experimental group.
- The pre-achievement test results of experimental boys and experimental girls are similar.
- The post-achievement test results of the experimental boys are better than the experimental girls.

### DISCUSSION

A significant difference between the means of the control group and the experimental group and also between pre & post-achievement of the experimental group was found. So here the null hypothesis is rejected in both cases. Thus, it can be inferred that the visual mapping program is more effective than the traditional teaching which increases the achievement of students in mathematics.

#### Education Implication:

1. Visual mapping program is more effective in increasing students' achievement.
2. Using Visual mapping as a teaching method in mathematics classes will help students to improve their conceptual understanding & constructive knowledge by connecting their previous knowledge to new knowledge.
3. They can construct their maps for self-study, revision & solving complex problems.
4. It can help students with note-taking.

### CONCLUSION

It can be concluded by current research that the visual mapping program is more effective in the mathematics achievement of students than traditional teaching.

### REFERENCES

[1]. Appoji. S & Shailaja. M.H. (2017). Effect of Concept Mapping on Academic Achievement of Students in Physics in Relation to Gender. *International Journal of Advanced Research in Education & Technology (IJARET)*, Vol. 4, Issue 1.

[2]. Ausubel, D.P.(1962). A subsumption theory of meaningful verbal learning and retention. *The Journal of General Psychology*, 66,213- 244.

[3]. Best, J.W& Kahn, James(2007) *Research in Education: The educational Report* (9th edition), pp76-77

[4]. Bloom, B. S. et.al, *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain*.New York: David McKay Co., Inc, 1956.

[5]. Héctor C. Santiago.(2011): *Visual Mapping to Enhance Learning and Critical Thinking Skills*.*Optometric Education* 129 Volume 36, Number 3.



- [6]. Hyerle, D.(1996): Thinking inking Maps: Seeing understands. Educational Leadership, Dec./Jan, Vol.53, Issue 4, (85-89) s
- [7]. Kaul,L.(2000),Methodology of Educational Research, Vikas Publishing House Pvt.Ltd.,New Delhi
- [8]. Mangal, S.K(2003), Statistics in Psychology and Education, Prentice Hall of India Pvt.Ltd., New Delhi.
- [9]. Manikandan,R & Murugaraju,P(2020): Mind mapping and achievement mathematics of the higher secondary school students,Volume: 6 | Issue: 12 |December 2020 || Journal DOI: 10.36713/epra2013 || SJIF Impact Factor: 7.032 ||ISI Value: 1.188.
- [10]. Novak J.D.(1990). Concept mapping: A useful tool for science education. Journal of research in science teaching.27 (10),937-949.