

Original Article

An Experimental Study of Effectiveness of Teaching Math's Mensuration for Development of 3d and 2d Vision in Class IX

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ABSTRACT

The present experimental study examines the effectiveness of teaching mathematics mensuration for the development of 2d and 3d vision among class ix students. The study was conducted using an experimental method with 60 students from english-medium schools in nagpur, divided equally into experimental and control groups. The experimental group was taught 2d and 3d mensuration through powerpoint presentations and activity-based teaching, while the control group was taught through the traditional method. A self-prepared questionnaire and pre-test/post-test were used for data collection, and the results were analyzed using mean, standard deviation, and t-test. The findings indicate that the experimental group showed greater improvement than the control group, with a post-test mean of 13.82 compared with 10.68 for the control group. The obtained t value was significant at both 0.05 and 0.01 levels. The study concludes that 2d and 3d mensuration teaching supported by technology is more effective than traditional teaching, enhances students' interest and understanding, and helps in retaining learned knowledge.

Keyword: 2d mensuration, 3d mensuration, mathematics teaching, experimental method, powerpoint presentation, activity-based learning, 2d and 3d vision, class ix, traditional teaching, student achievement.

INTRODUCTION

Mathematics is very important subject for human society. It is a subject which has its own culture. Mathematics helps person to develop his logical abilities. It also plays an important role in the development of civilization. The National Policy of Education (1986) has also considered the importance of mathematics in general education and suggests that mathematics should be visualized as the vehicle to train a child to think, reason, analyse and to articulate logically. Apart from being a specific subject it should be treated as concomitant to any subject involving analysis and reasoning. In the recent past, there has been tremendous development in theories of learning and the science of teaching. The commission points out that, 'In the teaching of mathematics emphasis should be more on the understanding of basic principles than on the mechanical teaching of mathematical computations.

Methods of Teaching Mathematics

There are many methods of teaching mathematics :

1. Lecture Method :
2. Inductive and Deductive Method :
3. Analytic and Synthetic Method
4. Heuristic Method
5. Project Method
6. Laboratory Method
7. Problem Solving Method



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Thus, out of all the available methods, every teacher has to make his own choice. After understanding all of them the teachers have to make their own decision.

Mensuration:

A branch of mathematics that talks about the length, volume, or area of different geometric shapes is called Mensuration. These shapes exist in

2 dimensions or 3 dimensions. Let's learn the difference between the two. Here, the concept of mensuration are explained and all the important mensuration formulas are provided. Also, the properties of different geometric shapes and the corresponding figures are given for a better understanding of these concepts.

2D Shape	3D Shape
If a shape is surrounded by three or more straight lines in a plane, then it is a 2D shape.	If a shape is surrounded by a no. of surfaces or planes then it is a 3D shape.
These shapes have no depth or height.	These are also called solid shapes and unlike 2D they have height or depth.
These shapes have only two dimensions say length and breadth.	These are called three dimensional as they have depth (or height), breadth and length.
We can measure their area and perimeter.	We can measure their volume, CSA, LSA or TSA.

Differences between 2D and 3 D shapes.

What is a mensuration in Maths?

In maths, mensuration is defined as the study of the measurement of various 2D and 3D geometric shapes involving their surface areas, volumes, etc.

What is the difference between mensuration and geometry?

Mensuration refers to the calculation of various parameters of shapes like the perimeter, area, volume, etc. whereas, geometry deals with the study of properties and relations of points and lines of various shapes.

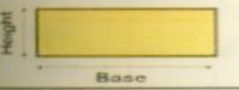
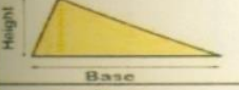
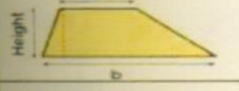
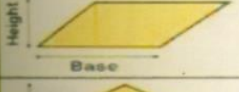
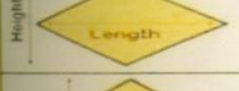
What are 2D and 3D Mensuration?

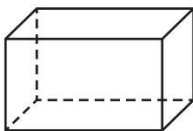
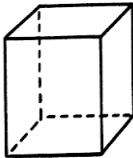
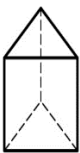
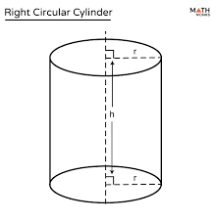
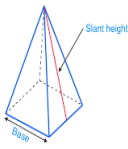
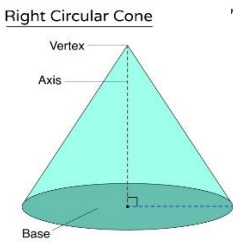
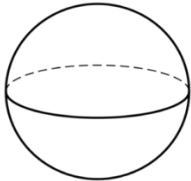
2D mensuration deals with the calculation of various parameters like area and perimeter of 2-dimensional shapes like square, rectangle, circle, triangles, etc,

3D mensuration is concerned with the study and calculation of surface area, lateral surface area, and volume of 3-dimensional figures like a cube, sphere, cuboid, cone, cylinder, etc.

Mensuration Formula

Using this mensuration formula list, it will be easy to solve the mensuration problems. In general, the most common formulas in mensuration involve surface area and volumes of 2D and 3D figures.

Shape	Name	Formula for Area
	Square	Base x Height
	Rectangle	Base x Height
	Triangle	Base x Perpendicular Height ÷ 2
	Trapezium	$\frac{(a + b) \times \text{height}}{2}$
	Parallelogram	Base x Perpendicular Height
	Rhombus	Length x Height ÷ 2
	Kite	Length x Height ÷ 2

Name of the solid	Figure	Lateral/ Curved Surface Area	Total Surface Area	Units
Cuboid		$2h(l+b)$	$2(lw + wh + lh)$	l – length b – breadth h - height
Cube		$4a^2$	$6a^2$	a - side
Right Prism		Perimeter of base+Height	Lateral surface area+ 2(area of one end)	
Right Circular Cylinder		$2\pi rh$	$2\pi r(h + r)$	r – radius h - height
Right Pyramid		Perimeter of base x slant height	Lateral surface area+ area of the base	
Right Circular cone		πrl	$\pi r(r + l)$	r – radius h - height
Sphere		$4\pi r^2$	$4\pi r^2$	r - radius

Need and Importance of the Study

Mensuration is the branch of geometry that deals with the measurement of area, length or volume in 2D and 3D shapes. The 2D shapes can be

drawn in a plane like square, rectangle, triangle, circle etc and 3D shapes cannot be represented in a plane like bricks, ice-cream cones, football, etc.

Mensuration includes computation using mathematical formulas and algebraic equations.

Statement of the Problem.

An experimental study of effectiveness of teaching math's mensuration for development of 3D and 2D vision in class IX.

Operational Definition

- 1) **Effectiveness:** It is a degree to which objectives are achieved.
- 2) **2D Mensuration:** 2D mensuration deals with the calculation of various parameters like area and perimeter of 2-dimensional shapes like square, rectangle, circular, triangles, etc.
- 3) **3D Mensuration:** 3D mensuration is concerned with the study and calculation of surface area, lateral surface area, and volume of 3-dimensional figures like a cube, sphere, cuboid, cone, cylinder etc.

Objectives of the Study

- 1) To identify 2D and 3D mensuration awareness among the students.
- 2) To prepare effective programme on 2D and 3D mensuration concepts.
- 3) To examine the effectiveness of 2D and 3D mensuration.
- 4) To compare 2D and 3D mensuration teaching & traditional way of teaching.

Assumptions

- 1) Math's mensuration for development of 3d and 2d teaching makes the content interesting.
- 2) It helps in retaining the learned knowledge.
- 3) Experimental teaching develops interest in the students, to study particular content

Hypothesis

There is a significant difference between 2D and 3D Mensuration teaching and traditional way of teaching.

Scope

Scope of the topic is very fast. It will be applicable to all the students of IX standard of state board school, Nagpur.

Limitation

- 1) The study will be limited to Nagpur City.
- 2) The study will be limited to English Medium School.
- 3) The study will be limited to Std IX.
- 4) The study will be limited for the research objective only.
- 5) The findings of the research will be limited only for the class students.

Related Review of Literature

Researcher has done an analytical study of the related review of literature. The researcher has chosen this topic to overcome many problems related to mensuration faced by the students while studying.

Research Methodology

Research methodology is a way to systematically solve the research problems. Researcher has selected experimental method.

Population

The students of Std IX of English Medium School of Nagpur city is the population of present study.

Sample

Researcher has selected 60 students of class IX of English Medium school of Nagpur City as a sample by random sampling.

S.N.	Name of School	No. of students taken as sample.
1.	M.B. Convent school, Gandhibagh, Nagpur	30
2.	Sevasadan School, Burdi, Nagpur	30

Experimental Method

Experimental method is the classic method in which elements are manipulated and the effects \

observed can be controlled. Experimental method is the study of the relationships among the variables those manipulated and those measured.

S.N.	Group	No. of Student	Total No. of student
1.	Control Group	30	60
2.	Experimental Group	30	

For the present study researcher has made use of parallel or equivalent group design.

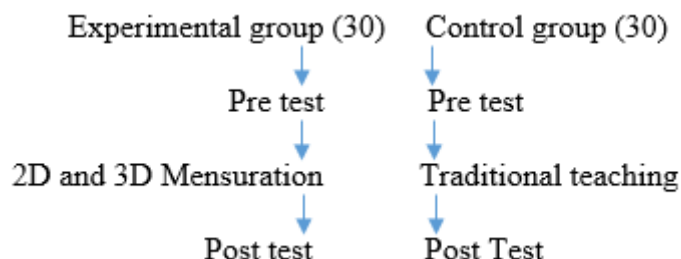
Equivalent group design:

An equivalent group design is a type of experimental design used to compare the effects of different interventions or treatments on two or more groups of participants. It aims to create

groups that are equivalent or similar in terms of key characteristics, such as demographics or pre-existing conditions, to minimize potential confounding variables and increase the internal validity of the study.

Advantage of Equivalent group:

1. It is free from weakness of the one group method.
2. As the control & experimental factors are applied simultaneously on different group the difficulties due to maturations & practices.

Basic Design:**Variable:**

- 1) Independent variable – Activity based learning model
- 2) Dependent variable – Student effectiveness

Statistical Tools**Questionnaire:**

For the present study, the researcher has made use of the questionnaire. A self prepared questionnaire as the tool of data collection. The 'questionnaire' is used in an educational research, consists of a series of questions or the statements to which individuals are asked to respond. The researcher has prepared questionnaire on a 2D and 3D Mensuration concept – 2D and 3D Mensuration the researcher has attained the clear understanding of the topic, objective of the study & the nature of the data needed.

Table No. A

Showing the division of student in two groups & method of teaching Used for teaching each group

S.N.	Group	No.of Students	Methods of Teaching
1.	Control Group	30	Traditional
2.	Experimental group	30	2D and 3D Mensuration

Lesson Plan & 2D and 3D Mensuration teaching:

1. Lesson plan on the topic 2D and 3D Mensuration was prepared according to Herbartian steps.
2. 2D and 3D Mensuration on the same group were prepared.

Teaching:

Experimental group: Experimental group were taught with 2D and 3D Mensuration. i.e. through power point presentation, 26 slides on the same topic were prepared.

- i) Control Group: Control group was taught by traditional way

Importance of Power point presentation.

- 1) Power point can gain student's attention and can motivate them to study.

As the topic of the study was "An experimental study of effectiveness of teaching math's mensuration for development of 3D and 2D vision in class IX" hence the tool used for this study was questionnaire.

- 1) **Pretest:** Pretest of 20 marks were given to the class to identify their 2D and 3D mensuration awareness, then two groups were made.
- 2) Experimental group (30 students)
- 3) Control group (30 students): It is more adequate experimental design, in which the relative effects of two treatments are compared on the basis of two or more groups which are equated in all relevant aspects. In this group design, First of all the population sample was selected randomly. Two groups were assigned randomly experimental and control group.

- 2) Colourful pictures, videos, music draw's students attentions, that can bring students into the sphere of topic.
- 3) Power point brings interest in students to learn the topic.
- 4) Power point brings interest in students to learn the topic.

Post Test: To check the effectiveness of both methods, post-test were given to both-control & experimental groups.

Pilot Study: - Before conducting actual experiment, to check the possibility of error, pilot study was conducted on 10 students; Two groups were made experimental group (5 students) & control group (5 students). The pre-test was given to both groups, control group were taught with traditional method

& experimental group with 2D and 3D Mensuration & the results obtained was analysed.

Statistical Procedure

On the collected data statistical procedure were applied to prove the stated hypothesis. The data characteristics such as Mean, standard deviation, 't' test were determined.

Analysis of the Research Objectives:

Objective –I: To Identify 2D and 3D Mensuration awareness among the students.

To achieve the above given objective, a test o 20 marks (pretest) was given to experimental & control group on the topic 'Ozone Layer'. The scoring were made to identify their 2D and 3D Mensuration awareness of both groups, scores obtained were calculated. Mean & standard deviation are given in table No. 1 & 2

Table No. 1

Shows Pre-test scores of control group

Group	N	M	σ
Control	30	6.36	1.79

Observation: From the above table, calculated mean of control group is 6.36 & Standard deviation is 1.79

Table No. 2

Shows Pre-test scores of experimental group

Group	N	M	σ
Control	30	5.14	3.84

Observation: The above table shows mean & standard deviation of experimental group for 30 students, mean is 5.14 & standard deviation is 3.84.

Interpretation:-

From the above scores, it was found that, there is not much more difference between the mean scores of controlled group & Experimental group the scores of the pretest predicts, that students were not well aware about the concept.

Objective -2: To Prepare effective programme on 2D and 3D Mensuration concept –

Power point presentation on the topic ozone layer was developed on Microsoft power point 2007 by the researcher for class VI, for this researcher made used of 2D and 3D Mensuration education books, internet, colourful pictures, were downloaded from the internet. C.D. of the power point presentation

were prepared, which is attached end of the dissertation and hard copy of the slides is also attached in appendix.

Objective -3: To examine the effectiveness of 2D and 3D Mensuration teaching.

To achieve the above objective, two groups were made control and experimental. Control group were taught with traditional(lecture) method, for the lesson plan was prepared, which is attached in the appendix. Experimental group were taught with the 2D and 3D Mensuration.

To examine the effectiveness of 2D and 3D Mensuration, scores obtained from the pretest and post test of experimental group were analysed and interpreted using 't' ratio, statistically analysed data is provided in table 3 and 4.

Table No. 3

Shows Pretest scores of control group

Group	N	M	σ
Control	30	10.68	2.84

Observation: From the above table, calculated mean of controlled group is 10.68 where as standard deviation of controlled group is 2.84 of thirty students.

Table No. 4

Showing the post test scores of Experimental group

Group	N	M	σ
Control	30	13.82	3.37

Observation: The above tale shows mean & standard deviation of experimental group for 30 students, mean is 13.82 & standard deviation is 3.37

Interpretation:-

The above table 3 & 4 shows the mean of experimental group is greater than control group, the use of 2D and 3D Mensuration teaching contributed the improvement of the students performance.

Objective -4: To compare 2D and 3D Mensuration teaching and traditional based teaching

To achieve the above objective, calculated Mean, standard deviation of post test of both the group was compared, statistical analysis of pre-test & post test of controlled group & experimental group were made and compared.

Table No. 5**Table showing pre-test and post test scores of control group**

Test	N	M	S.D.	σ Dm	Dm	't' value	Significance
Pre-test	30	6.36	1.79	0.47	4.32	9.11	Significant at 0.01 & 0.05 level
Post Test		10.68	2.84				

Observation: Table 5 shows pre test and post test scores of experimental group. Calculated mean of pre test is 5.14 of post test is 13.82. Standard errors of mean difference is 3.84. Mean difference of both the test is 3.37

The calculated 't' value was found to be 12.07, which is greater than tabular 't' value at 12.07 (1.671) & 0.01 (2.3900 level).

Interpretation:

The 't' value among pre test and post test is greater, it certainly shows that there exists a remarkable significant difference between the two test value and tabulated values, the obtained 't' value is smaller than the 't' value obtained in experimental group. Mean difference between the two group is small as compared to experimental group.

Table No. 6**Table showing pre test and post test scores of experimental group.**

Test	N	M	S.D.	σ Dm	Dm	't' value	Significance
Pre test	30	5.14	3.84	0.71	8.68	12.07	Significant at 0.01 & 0.05 level
Post test		13.82	3.33				

Observation: Table 6 shows pretest & post test scores of experimental group. Calculated mean of pretest is 5.14 of post test is 13.82. Standard errors of mean difference is 3.84. Mean difference of both the test is 3.37.

The calculated 't' value was found to be 12.07, which is greater than tabular 't' value at 12.07 (1.671) & 0.01 (2.390) level.

Interpretation:-

The calculated 't' value shows that, the difference between the mean of pretest & post test is significant mean difference between the pretest and post test score is in greater extent.

Table No. 7**Comparison of scoring of experimental group and control group**

Group		N	M	S.D.	σ Dm	Dm	't' value
Controlled	Pre-test	30	6.36	1.79	4.32	0.47	9.11
	Post test		10.68	2.84			
Experimental	Pre Test	30	5.14	3.84	8.68	0.71	12.01
	Post Test		13.82	3.33			

Observation: Mean of control group of pretest is 6.36 and post test 10.68. S.D. of pretest is 1.79 and post test is 2.84, Difference between the mean score is 4.32

Mean of experimental group is pretest of 5.14 and post test of 13.82 S.D. of pretest is 3.84 and post test is 3.33, difference between the mean is 8.68

Interpretation:

Mean differences of experimental group is greater than mean controlled group, which reviles

that when taught with 2D and 3D Mensuration teaching, students achieve more score than traditional teaching.

Testing of Hypothesis of the research

Hypothesis: "There is significant difference between 2D and 3D Mensuration teaching and traditional based teaching.

To prove the above hypothesis two groups were made – experimental and control group. Experimental group were taught with power point

presentation and control group with traditional method.

The scores obtained were analysed, t-test were applied on the post test scores of the both groups to verify the mean scores obtained of the two groups.

Table No.8

Analysis of the post test scores of experimental and control group

Mean, S.D., 't' value obtained after the calculation of the both groups is given in the following table :

S.N.	No.of Student	Mean	S.D.	't'	Significance level	Accept/Reject
1	30	10.68	2.84	5.09	0.05	Accept
2.	30	13.82	3.33		0.01	Accept

1. Mean scores of the post test of control and experimental group is 10.86 & 13.82
2. Calculated 't' value of both the group was found to be 5.09 greater than df value at 0.05 and 0.01 level.
3. SD of the post test of control and experimental group is 2.84 & 3.33.
4. Difference between the mean of experimental group and controlled group mean is very significant.
5. Obtained 't' value is greater than table 't' value at both 0.05 (1.658) and 0.01 (2.358) level.
6. Students in experimental group performed significantly better than students in control group.

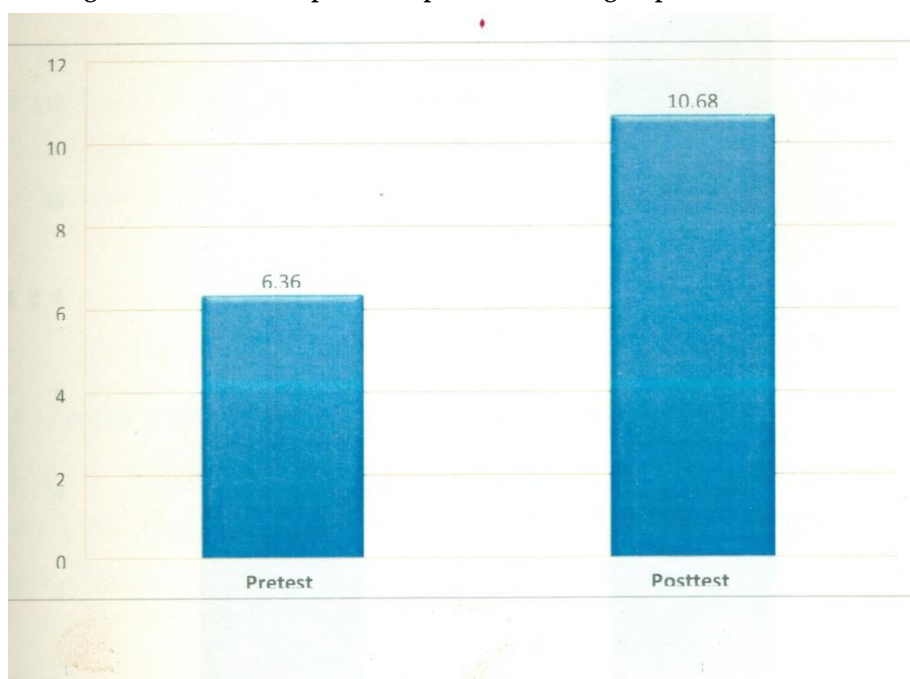
7. $T=5.09 < 0.01$ and < 0.05 level

Interpretation:-

1. According to above observation it is clear that, students learn through 2D and 3D Mensuration teaching scored higher marks as compared to students learning through traditional method.
2. 2D and 3D Mensuration teaching helped to retain the learned knowledge and had help students to show great interest in learning.
3. Variation in the post test scores of both the groups occurred due to the treatment given to the experimental group, i.e. through 2D and 3D.

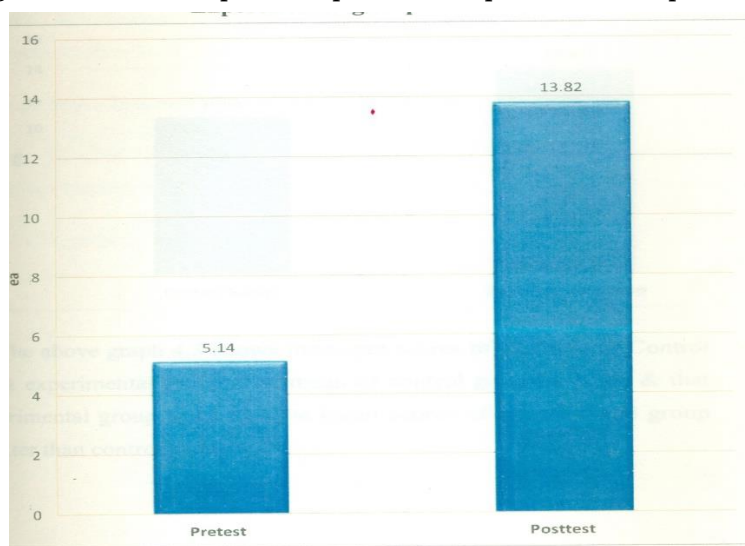
Graph No. 1

Bar Graph showing the mean scores of pre test & post test control group



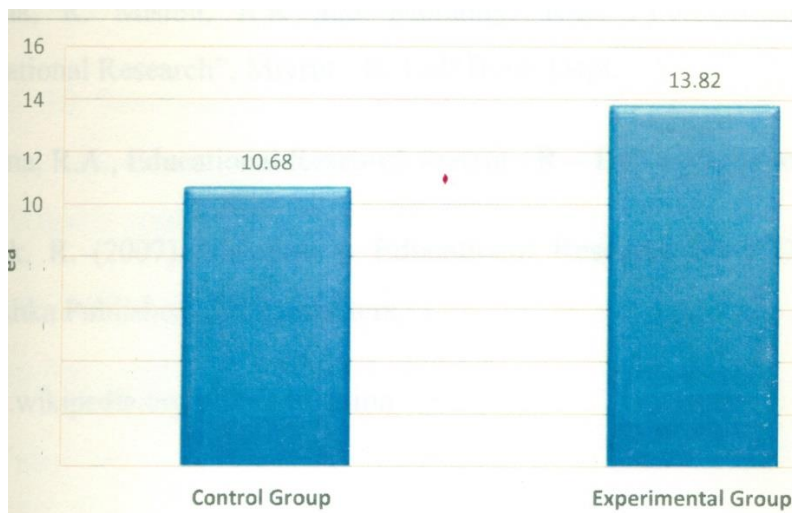
The above graph 1 shows the mean scores of pre test & post test of control group. The mean of pre test of control group is 6.36 and that of post test of

control group is 10.63. The scores of the post test is higher than pre test scores. The mean difference of both the test is less.

Graph No. 2**Bar Graph showing the mean scores of pre test & post test of Experimental Group**

The above graph 2 shows the mean scores of pre test & post test of experimental group. The mean of pre test of experimental group is 5.14 and that of

post test of experimental group is 13.82. The difference between the pretest and post test mean is greater.

Graph No. 3**Bar Graph showing the mean scores of post test of both control and Experimental Group**

The above graph 3 shows the mean scores of post test of control group and experimental group. The mean of control group is 10.68 and that of experimental group is 13.82. The mean scores of experimental group are greater than control group.

Objective wise Conclusion

1. 2D and 3D Mensuration awareness was not sufficient among the students. Achievement of both the group experimental & controlled in pretest is nearly same.
2. The conduction of power point presentation (2D and 3D Mensuration teaching) was proved effective students got focused on the topic.
3. Lesson plan converted into digital format enhance the effectiveness of teaching.
4. 2D and 3D Mensuration teaching is more effective in 2D and 3D mensuration education teaching than traditional classroom teaching.
5. There is no significant difference between the pretest & post test scores of controlled group.
6. The group taught through 2D and 3D Mensuration teaching has shown a substantial progress.
7. 2D and 3D mensuration teaching proved to be more effective than traditional teaching.
8. With the blending of technology and education, learning become more easy, interesting and durable the hence prove the hypothesis.

Hypothesis wise Conclusion:

1. Obtained 't' value is greater than table 't' value at both 0.05 (1.658) and 0.01(2.358) level.
2. Students in experimental group performed significantly better than students in control group.
3. $T=5.09 < 0.01$ and < 0.05 level.

From the above conclusion, it is crystal clear that 2D and 3D Mensuration subject can be taught very effectively by using computer along with the traditional teaching. The students learning with the help of computer programme can achieve greater than the students learning through the conventional method it also helps to retain the knowledge for longer time & proves its effectiveness.

Acknowledgement

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