Attitude Of Teachers Towards Use Of Mathematics Laboratory In Teaching Learning Process In High Schools

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Abstract: This paper examined the effect of instructional materials and teaching methodology and high school mathematics teachers view about use mathematics laboratory achievement among high school students of Amravati division of Vidarbha. Descriptive survey research design was adopted, and the population for the study comprises 120 high school teachers of Amravati. Simple random sampling technique was the sampling method used to select thirty secondary schools in each educational district from the four educational districts in Maharashtra State. For the purpose of data collection three research instruments were used by the researcher, the instruments were titled: ''Questionnaire on Effect of Instructional Materials on Mathematics Achievement, Questionnaire on Effect of Teaching Methodology on Mathematics Achievement and researcher developed attitude scale for use of Mathematics laboratory in teaching learning process. These instruments were self-developed questionnaires. A reliability test was conducted on the instruments using test-retest method, a reliability coefficient of 0.76 and 0.82 were obtained. In order to determine the effect of instructional materials and teaching methodology on mathematics achievement among high school teachers. State three research questions and four hypotheses were formulated to guide the study. The hypotheses were tested at 0.01 level of significant using Chi-Square statistics. The results revealed that teaching methodology has significant effect on mathematics achievement among high school students .It was recommended that teachers should learn how to improvise instructional materials from the local environment instead of using foreign materials that students are not familiar with. Teacher should learn how to use diverse methodology in their teaching rather than restrict themselves to a particular method. The value of X^2 is 143.98 and which is far more than 13.27 (table value). So According to views of high school teacher use of mathematics laboratory create interest among students. That's they have favorable attitude towards use of mathematics laboratory in creation of interest in the subject. More than 93% of teachers agree about the use mathematics laboratory to increase the interest of students in mathematics subject. So use of mathematics laboratory create interest in the subject. Though it is not available in their schools.

Keywords: Attitude, Mathematics Teaching, Mathematics Concept, Mathematics Laboratory.

I. INTRODUCTION

Mathematics laboratory includes models of geometrical shapes or paper cutting, paper folding techniques, concrete objects, charts, graphs, pictures, posters, blocks games, circle game, fraction model, geometrical geo sticks, measurement scales pattern, sorting, theorem etc. Mathematics lab is important especially for students of class1 to class 12. Mathematical games and puzzles are important for mental development of students. The activities could be done individually by students or with teachers. At this place students do experiments with numbers and geometrical shapes and try to generalize patterns. Students solve real life problems with real data because complex calculations are no longer a major consideration. Students make charts and models to illustrate mathematical ideas. The creativity of student development is allowed free play. Students find areas and volume of both regular and irregular solids. Interfaces between algebra, geometry, probability, calculus etc are experimented. Students enjoy learning mathematics. Mathematics has always occupied an important place in school curriculum. Mathematics Laboratory is a place where

students can learn and explore mathematical concepts and verify mathematical facts and theorems through a variety of activities using different materials. These activities may be carried out by the teacher or the students to explore, to learn, to stimulate interest and develop favourable attitude towards mathematics. That is, a mathematics laboratory is a place where we find a collection of games, puzzles, teaching aids and other materials for carrying out activities. These are meant to be used both by the student by their own and together with their teacher to explore the world of mathematics, to discover, to learn and to develop an interest in mathematics. Although mathematics is not an experimental science in the way in which physics, chemistry and biology are, a mathematics laboratory can contribute greatly to the learning of mathematical concepts and skills.

Need and Purpose of Mathematics Laboratory Some of the ways in which a Mathematics Laboratory can contribute to the learning of the subject are:

✓ It provides an opportunity to students to understand and internalize the basic mathematical concepts through concrete objects and situations.
✓ It enables the students to verify or discover several geometrical properties and facts using models or by paper cutting and folding techniques.
✓ It helps the students to build interest and confidence in learning the subject.
✓ The laboratory provides opportunity to exhibit the relatedness of mathematical concepts with everyday life.
✓ It gives more scope for individual participation. It encourages students to become autonomous learners and allows a student to learn at his or her own space.
✓ It provides scope for greater involvement of both the mind and the hand which facilitates cognition.
✓ The laboratory allows and encourages the students to think, discuss with each other and the teacher and assimilate the concepts in a more effective manner.
✓ It enables the teacher to demonstrate, explain and reinforce abstract mathematical ideas by using concrete objects, models, charts, graphs, pictures, posters, etc.
✓ It widens the experiential base, and prepares the ground for later learning of new areas in mathematics and of making appropriate connections.
✓ In various puzzles and games, the students learn the use of rules and constraints and have an opportunity to change these rules and constraints. In this process they become aware of the role that rules and constraints play in mathematical problems.
✓ Because of the larger time available individually to the student and opportunity to repeat an activity several times, students can revise and rethink the problem and solution. This helps to develop meta cognitive abilities.
✓ It builds up interest and confidence in the students in learning and doing mathematics.
✓ Importantly, it allows variety in school mathematics learning.
✓ Mathematics Lab provides a conducive ambience for students to learn the subject in a joyful manner through practical activities and interaction.
✓ Teachers need to pay attention to both the transactional strategies and evaluation strategies.

✓ Simple experiments and projects will lead to the development of different skills like numerical, observation, thinking, analytical and so on.
✓ Establishing a Mathematics Lab does not involve high cost. Improvised aids using inexpensive material can be made.

OBJECTIVES OF THE STUDY

The study aimed at fulfilling the following objectives:
✓ To develop the attitude scale towards use of mathematics laboratory for high school teachers.
✓ To find out the views teachers towards use of laboratory as self learning tool at high school level.
✓ To find out the views teachers towards use of laboratory for creation of interest of subject
✓ To find out the views of teachers towards use of laboratory to all concepts of maths syllabus.
✓ To find out the views teachers towards use of laboratory lesson plan.

HYPOTHESES

The following null hypotheses were formulated by the above objectives:

HO: 1 There is no significant difference between teacher attitude towards use of mathematics laboratory.

HO: 2 There is no significant difference between views teachers towards use of laboratory as self learning tool at high school level.

HO: 3 There is no significant difference between views teachers towards use laboratory for creation of interest of subject

HO: 4 There is no significant difference between views teachers towards use of laboratory to teach all concepts of syllabus.

HO: 5 There is no significant difference between views teachers towards use of laboratory lesson plan.

II. OPERATIONAL DEFINITIONS

ATTITUDE: It is referred as the tendency to react favourable/ positive or unfavorable/negative towards use of mathematics laboratory in teaching learning process.

HIGH SCHOOL TEACHERS: Teachers of aided and granted schools are considered for research purpose teaching to 8th 9th and 10th class students of state board school .

MATHEMATICS: Mathematics has the four fundamental operations of addition, subtraction, multiplication and division. Mathematics subject covers the topics such as real number system, algebra, logarithms, geometry, mensuration, probability, graphs and statistics at secondary level.

HIGH SCHOOL: The high school consists of VIII, IX and X standard students Classess in the Educational system. It was followed by secondary school syllabus. The present study only selected granted school teachers.

MATHEMATICS LABORATORY: The Mathematics Laboratory is a room, rich in manipulative material, to which children have ready access to handle them, perform

mathematical experiments, play mathematical games, solve mathematical puzzles and become involved in other activities through proper guidance of teacher.

III. RESEARCH DESIGN

This research was basically a survey approach with some orientation to explorations of opinion finding their roots and also to implement them to actions. Therefore, the present researcher used a mixed approach in educational research.

SAMPLE

This was Random sample consisting of 120 High school mathematics teachers from different schools of Amravati division of Vidarbha.

INSTRUMENT

The instrument was a Mathematics Laboratory Questionnaire, which included thirty five statements. The Mathematics Laboratory Questionnaire consisted of two parts: Part A sought information on school data: name of school and state, type and location of school. Part B sought information on the existence and operation of mathematics laboratories in schools and views of teacher regarding use of mathematics laboratory in teaching learning process.

STATISTICAL USED: The mean, standard deviation and chi square - test were used for analyzing the data.

SOME OF STATEMENTS OF SCALE ARE AS

Sr. No	STATEMENT	S.A	A	U	D	S.D.
1.	Maths laboratory create more interest in subject.	60 (50%)	52 (43%)	04 (3%)	04 (3%)	00
2.	Maths laboratory play vital role in maths learning.	36 (30%)	52 (43%)	16 (13%)	16 (13%)	00
3.	Maths laboratory is essential for self learning of students.	12 (10%)	48 (40%)	20 (17%)	40 (33%)	00
4.	Maths laboratory helps in the completion of maths syllabus.	08 (7%)	40 (33%)	44 (37%)	08 (7%)	08 (7%)
5.	The equipments which are used in maths laboratory are costly.	04 (3%)	24 (20%)	48 (40%)	40 (33%)	00
6.	Maths laboratory is not useful for each and every concept.	08 (6%)	60 (50%)	44 (37%)	08 (6%)	00
7.	Development of Maths laboratory is expensive.	08 (6%)	44 (37%)	12 (10%)	48 (40%)	08 (7%)

Table 1

CREATE INTEREST

Create interest	SA	A	U	D	SD	Total
Observed Frequency (f_o)	60	52	04	04	00	120
Expected Frequency (f_e)	24	24	24	24	24	120
($f_o - f_e$)	36	28	-20	-20	-24	
($f_o - f_e$)^2	1296	784	400	400	576	

| $\frac{(fo - fe)2}{fe}$ | 54 | 32.66 | 16.66 | 16.66 | 24 | |

Table 2

$$X^2 = \sum (\frac{(fo - fe)2}{fe} = 54+32.66+16.66+16.66+24 = 143.98$$
Df = 4

The value of X^2 is 143.98 and which is far more than 13.27 (table value). So According to views of high school teachers use of mathematics laboratory create interest among students. That's they have favorable attitude towards use of mathematics laboratory in creation of interest in the subject. More than 93% of teachers agree about the use mathematics laboratory to increase the interest of students in mathematics subject. So use of mathematics laboratory create interest in the subject. Though it is not available in their schools.

SELF LEARNING

Self Learning:	SA	A	U	D	SD	Total
Observed Frequency (f_o)	12	48	20	40	00	120
Expected Frequency (f_e)	24	24	24	24	24	120
($f_o - f_e$)	-12	24	-4	16	-24	
($f_o - f_e$)^2	144	576	16	256	576	
$\frac{(fo - fe)2}{fe}$	6	24	0.66	10.66	24	

Table 3

$$X^2 = \sum (\frac{(fo - fe)2}{fe}) = 6+24+0.66+10.66+24 = 65.32$$
Df = 4

The value of X^2 is 65.32 and which is far more than 13.27 (table value). So According to views of high school teachers use of mathematics laboratory is essential for self learning of high school students. That's they have favorable attitude towards use of mathematics laboratory in creation of interest in the subject. More than 60% of teachers agree about the use mathematics laboratory as self learning tool.

LABORATORY IS NOT USEFUL FOR EACH CONCEPT

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
Observed Frequency (f_o)	12	64	36	08	00	120
Expected Frequency (f_e)	24	24	24	24	24	120
($f_o - f_e$)	-12	40	12	-16	-24	
($f_o - f_e$)^2	144	1600	144	256	576	
$\frac{(fo - fe)2}{fe}$	6	66.66	6	10.66	24	

Table 4

$$X^2 = \sum (\frac{(fo - fe)2}{fe}) = 6+66.66+6+10.66+24 = 113.32$$

The value of X^2 is 113.32 and which is far more than 13.27 (table value). So According to views of high school teachers use of mathematics laboratory is not useful for each and every concept of mathematics curriculum. That's they have unfavorable attitude towards use of mathematics laboratory for each and every concept of mathematics.

LESSON PREPARATION IS TIME CONSUMING

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
Observed	12	80	20	08	00	120

Frequency (f$_o$)						
Expected Frequency (f$_e$)	24	24	24	24	24	120
(f$_o$ – f$_e$)	-12	56	-4	-16	-24	
(f$_o$ – f$_e$)^2	144	3136	16	256	576	
$\frac{(fo - fe)2}{fe}$	6	130.66	0.66	10.66	24	

Table 5

$$X^2 = \sum (\frac{(fo - fe)2}{fe} = 171.98$$

The value of X^2 is 171.98 and which is far more than 13.27 (table value). So According to views of high school teachers preparation of mathematics lesson plans are time consuming. Thus preparation of mathematical lesson plans needs more practice than traditional lesson plans. Thus lab activity planning needs more time than the traditional way of teaching.

I HAVE PREPARED TEACHING AIDS TO PROVE THEOREM

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
Observed Frequency (f$_o$)	04	56	20	40	00	120
Expected Frequency (f$_e$)	24	24	24	24	24	120
(f$_o$ – f$_e$)	-20	32	-4	16	-24	
(f$_o$ – f$_e$)^2	400	1024	16	256	576	
$\frac{(fo - fe)2}{fe}$	16.66	42.66	0.66	10.66	24	

Table 6

$$X^2 = \sum (\frac{(fo - fe)2}{fe} = 94.64$$

The value of X^2 is 94.64 and which is far more than 13.27 (table value). So According to views of high school teachers prepared teaching aids on for the proving the theorem. Thus teacher view regarding preparation of mathematical teachings aids is much more favorable.

CHALK AND BLACKBOARD ARE MORE USEFUL IN MATHEMATICS LABORATORY

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
Observed Frequency (f$_o$)	48	44	16	12	00	120
Expected Frequency (f$_e$)	24	24	24	24	24	120
(f$_o$ – f$_e$)	24	20	-8	-12	-24	
(f$_o$ – f$_e$)^2	576	400	64	144	576	
$\frac{(fo - fe)2}{fe}$	24	16.66	2.66	6	24	

Table 7

$$X^2 = \sum (\frac{(fo - fe)2}{fe} = 73.32$$

The value of X^2 is 73.32 and which is far more than 13.27 (table value). So According to views of high school teachers Chalk and Blackboard are most useful in mathematics teaching learning. Thus Chalk and Blackboards are used by 92% of the high school teacher.

DIFFERENT METHODS ARE USED TO TEACH MATHEMATICS

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
Observed Frequency (f$_o$)	60	56	00	04	00	120
Expected Frequency (f$_e$)	24	24	24	24	24	120
(f$_o$ – f$_e$)	36	32	-24	-20	-24	
(f$_o$ – f$_e$)^2	1296	1024	576	400	576	
$\frac{(fo - fe)2}{fe}$	54	42.66	24	16.66	24	

Table 8

$$X^2 = \sum (\frac{(fo - fe)2}{fe}) = 161.32$$

The value of X^2 is 161.32 and which is far more than 13.27 (table value). So According to views of high school teachers Different methods of teaching are most useful in mathematics teaching. Thus Mathematics teaching needs various skills and strategies. Thus 98% teachers are favorable in application of different teaching methods of mathematics.

IV. CONCLUSION

The results of this study lead us to an important conclusion that More than 93% of teachers agree about the use mathematics laboratory to increase the interest of students in mathematics subject. So use of mathematics laboratory create interest in the subject. So According to views of high school teachers prepared teaching aids on for the proving the theorem. Thus teacher view regarding preparation of mathematical teachings aids is much more favorable. So teachers attitude towards use of mathematics laboratory is most favorable. Policy maker should focus on issue of development of mathematics laboratory at high school level in Maharashtra state.

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