Effectiveness of Mathematics Club Activities in Terms of Achievement in Mathematics and Some Non-Scholastic Objectives of Teaching Mathematics to Secondary Students

Dr. Rajesh Kumar Gour
Head of the Department
Shri Jain Shwetambar Professional Academy, Indore

Dr. S.K. Tyagi
Professor & Head
School of Education
Devi Ahilya Vishwavidyalaya, Indore

Abstract

Mathematics club, like other subject clubs is a forum for organizing number of meaningful, purposeful and learning- oriented Mathematical activities. Broadly speaking, it can be organized in the same way or on the same pattern as other subject clubs or even the *co-curricular activities. The present effort is aimed to study the effect of Mathematics club on Achievement and Interest in mathematics. The researcher formulated null hypotheses for study. The achievement test was developed by the researcher and standard tools were used to collect the data related to interest and other variables. The study was experimental in nature and it was designed on non-equivalent control group design. The sample of the study comprised of 77 students of Ninth graders chosen by purposive sampling method. The mathematics club activities were found effective on Achievement and Interest in mathematics.*

Introduction

To arouse and maintain the students' interest in Mathematics is a major challenge for the teachers of mathematics. The general perception of students regarding Mathematics is that it is dry, dull and uninteresting subject. The perception is largely due tothe uncritical, bookish and routine transaction of Mathematics in our classrooms. Classroom teaching throws little challenges to students who are very often spoon-fed through single track lecturing by Mathematics teachers. Students work most effectively at tasks which ensure their active participation and in which they are genuinely interested. Activities in Mathematics are helpful in harnessing individuals' creative experiences.

- Activities in mathematics –
- Lead to their mental, emotional and social development.
- Have utilitarian, practical and behavioral values.
- Stimulate and maintain Interest in the subject.
- Lead to the development of proper Attitude towards Mathematics.

Mathematics Club Activities

Mathematics club, like other subject clubs is a forum for organizing number of meaningful, purposeful and learning- oriented Mathematical activities. Broadly speaking, it can be organized in the same way or on the same pattern as other subject clubs or even the co-curricular activities.

Typically mathematics club will have a Patron – Principal,a President – HOD of Mathematics, a Secretary – Active Mathematics Teacher, Members – other Mathematics teachers and Student Representative – Active student of Secondary class. This club can play a significant role in the entire curriculum of school. It can serve a number of purposes:

1. It can provide a forum to those interested in Mathematics for Mathematical activities.
2. The students get opportunities of participating in Mathematics exhibitions, Mathematical hobbies, Recreational Mathematics activities, Mathematical games, Mathematical discussions, Mathematical debates, Mathematical innovations, Enacting Mathematics related plays.
3. The club is a medium of developing student's interest in the Mathematics.
4. It offers platform for celebration of important days like birthdays of Mathematicians.
5. It provides to the students an opportunity for interacting with experts of Mathematics from outside. They can be invited to address the students on different topics.
6. It is an agency for providing Intra School and Inter-school Mathematical competitions.
7. It provides opportunities of premium reading of Mathematical literature.
8. It is an agency to exploit Mathematics laboratory for furtherance of learning objectives.
9. It is a medium of exchange of Mathematical informations, experiments and innovations.
10. It provides the opportunity of Leadership, Cooperation, Joint responsibilities and Active participations.

Review of Related Studies

There have been number of research studies investigating into effectiveness of different strategies of teaching in terms of Achievement in Mathematics.

Dahiya (1996) studied effectiveness of Mastery learning strategy, Vishwanathan (1997) diagnostic error learning strategy, Chilkara (1985) different strategies of teaching, Das and Barua (1968) remedial teaching strategies, Muthia (1994) cooperative learning strategy, Nayayni (1992) number games to teach mathematics, Prabha (1992) programmed Mathematics, Rao (1986) Guided discovery and expository approaches of teaching Mathematics in terms of enhancing Achievement in Mathematics. Singh (1992) studied effect of computer assisted instruction on Achievement in mathematics. It was concluded that Achievement of students taught through above different strategies was significantly higher than the students taught through conventional methods.

None of the studies reviewed above was aimed at exploring the effect of Activity approach to teaching-learning of Mathematics on Achievement in Mathematics. There is a need to chalk out strategyto develop interest in Mathematics. Hence, the present study was taken up by the researcher.

Objectives

The following were the objectives of the study:

1. To study the effect of Treatment, Gender and their Interaction on Achievement in Mathematics by considering pre Achievement in Mathematics as covariate.

2. To study the effect of Treatment, Personality and their Interaction on Interest in Mathematics by considering pre Interest in Mathematics as covariate.

Methodology

The present study was experimental in nature and it was designed on the model of non-equivalent control group design.

Sample

The sample consisted of 77 students of Ninth graders chosen by purposive sampling method. Both Boys and girls were part of the sample. The Experimental group consists of 40 students, while control group consists of 37 students.

Tools

The study had two dependent variables namely Achievement in Mathematics and Interest in Mathematics. There were two independent variables, namely, Gender and Personality. The tools to measure the variables were as follows:

Achievement in Mathematics: The Achievement in Mathematics of students of the experimental and the control group students was assessed by Achievement in Mathematics Test developed by the Researcher for Ninth graders on topics of Quadrilateral, Circle and Area of Triangles and Quadrilaterals.

Interest: Interest in Mathematics of both Experimental and Control group students was assessed by administering them by Mathematics Interest Inventory developed by Dubey.

Personality: Personality of students was assessed by administering them by Maudsley Personality Inventory adapted by Jalota and Kapoor.

Treatment

As a treatment, Mathematics club activities developed by the researcher were used for the Experimental group. Following were the topic-wise activities developed for the Experimental group.

Topic-Wise Mathematics Club Activities Organised

Activities and Topic covered

1. **Paper folding Activity**-Types of Quadrilateral

2. **Paper Cut** and **Paste Activity**-Angle sum property of Quadrilateral Quiz based on Angle sum property

3. **Cut and Paste activity**-Properties of Parallelogram - Thread activity - Paper Cutting activity

4. **Expert lecture**-Numerical based on - Cross word puzzle Properties of Parallelogram

- Puzzles by match sticks

5. **Quiz**- - Cut and Paste activity, Midpoint theorem

6**. Graph activity** -Area property of figures on the same base and between the sameparallels .Properies of Median of a triangle

7. **Paper folding activity**-Area of Rhombus

8. **Geo Board activit** - Area relationship between triangles on the samebase and between the same parallels

9. **Paper folding activity**-Property of Perpendicular drawn from centre of circle and the chordBasic terms of circle

10. **Drawing Board activity**- Relationship between angle subtended by an arc at the centre and the anglesubtended by it at any pointon the remaining part of the circle

11. **Broom sticks activity-**Distance of Equal chords ofa circle from the centre of circle

12. **Geometry Boa**rd **activity** -Angle subtended by equal chord at centre

13. **Quiz**-Cyclic quadrilateral and - Expert lecture questions based on it –

Cut and paste activity Supplementary nature ofopposite angles of cyclic

- Model demonstration-quadrilateral - Exhibition of models and charts

Data Collection Procedure

The data with respect to the dependent variable namely, Achievement in Mathematics was collected by administering the Achievement in Mathematics Test to the samples before and after conclusion of the Treatment. Similarly, the Interest in Mathematics of the students was pre and post assessed by administering the Mathematics Interest Inventory to both the groups. The Treatment lasted about two months at the rate of one period per day. The data related to the Personality of the students were collected by administering the Maudsley Personality Inventory adapted by Jalota and Kapoor during the process of the experiment.

Data Analysis Procedure

2X2 factorial design ANCOVA was used for data analysis.

Results and Interpretation

1. **Effect of Treatment, Gender and their Interaction on Achievement in Mathematics by considering pre Achievement in Mathematics as covariate.**

The first objective was "To study the effect of Treatment, Gender and their Interaction on Achievement in Mathematics by considering pre Achievement in Mathematics as covariate". There were two levels of Treatment namely, Mathematics club activities and Traditional method. The students were categorized into two levels on the basis of their Gender, namely Male and Female. Thus there were two levels of Treatment and two levels of Gender. Therefore, the data were analyzed with the help of 2x2 factorial design analysis of covariance. The results are given in the Table 1

Table 1: Summary of 2x2 factorial design ANCOVA for Achievement in Mathematics by considering pre Achievement in Mathematics is taken as covariate

Source of Variation	df	SSy.x	MSSy.x	Fy.x
Treatment	1	870.235	870.235	89.319**
Gender	1	2.741	2.741	0.281
Treatment * Gender	1	27.716	27.716	2.845
Error	72	701.494	9.743	
Total	75			

**Significant at 0.01 level of significance

The adjusted F-value for the Treatment is 89.319 which is significant at 0.01 level of significance with degree of freedom 1/72. It indicates that the adjusted mean scores of Achievement in Mathematics of students taught through Mathematics club activities and Traditional method differ significantly when pre Achievement in Mathematics is taken as covariate. In the light of this the null hypothesis that "There is no significant difference in the adjusted mean scores of Achievement in Mathematics when taught through Mathematics club activities and Traditional method by considering pre Achievement in Mathematics is taken as covariate" is rejected.

Since the adjusted mean score Achievement in Mathematics of students taught through of Mathematics club activities is 23.022 which is significantly higher than the adjusted mean score of Achievement in Mathematics of students taught through Traditional method which is 15.992, it reflects that the Achievement in Mathematics of the students taught through Mathematics club activities was found to be significantly superior to the students of Traditional method, when both groups were matched with respect to pre Achievement in Mathematics. It may therefore be concluded that Mathematics club activities were found to be superior to Traditional method in terms of Achievement in Mathematics when groups were matched with respect to pre Achievement in Mathematics.

The adjusted F-value for Gender is 0.281 which is not significant at 0.05 level of significance. It indicates that the adjusted mean scores of Achievement in Mathematics of Male and Female students did not differ significantly when pre Achievement in Mathematics is taken as covariate. It

reflects that there is no significant influence of Gender on Achievement in Mathematics of students when pre Achievement in Mathematics is taken as covariate. Thus the null hypothesis that, "There is no significant influence of Gender on Achievement in Mathematics of students when pre Achievement in Mathematics is taken as covariate" is not rejected. If reflects that both Male and Female students were found to be achievers to the same extent when groups were matched with respect to pre Achievement in Mathematics.

The adjusted F-value for Interaction between Treatment and Gender is 2.845 which is not significant at 0.05 level of significance. It indicates that there is no significant influence of resultant of Interaction between Treatment and Gender on Achievement in Mathematics of students when pre Achievement is taken as covariate. In this context the null hypothesis that "There is no significant effect of the Interaction between Treatment and Gender on Achievement in Mathematics is taken as covariate" is not rejected.

It may therefore be concluded that Achievement in Mathematics was found to be independent of Interaction between Treatment and Gender when pre Achievement in Mathematics is taken as covariate. It shows that irrespective of the nature of Treatment, the Achievement in Mathematics of Male and Female students was found to enhanced equally when groups were matched with respect to pre Achievement in Mathematics.

2. Effect of Treatment, Personality and their Interaction on Interest in Mathematics by considering pre Interest in Mathematics as covariate.

The second objective of the study was "To study the effect of Treatment, Personality and their Interaction on Interest in Mathematics by considering pre Interest in Mathematics as covariate". There were two levels of Treatment namely Mathematics club activities method and Traditional method. The students were categorized into two levels on the basis of their personality namely Extrovert and Non Extrovert.

Thus, there were two levels of Treatment and two levels of Personality therefore the data were analyzed with the help of 2x2 factorial design analysis of covariance. The results are given in Table 2

Table 2: Summary of 2x2 factorial design ANCOVA for Interest in Mathematics by considering pre Interest in Mathematics as covariate

Source of Variation	df	SSy.x	MSSy.x	Fy.x
Treatment	1	248.623	248.623	9.442**
Personality	1	2.262	2.262	0.770
Treatment * Personality	1	4.614	4.614	0.677
Error	72	1869.621	26.333	
Total	75			

**Significant at 0.01 level of significance

The adjusted f-value of the Treatment is 9.442, which is significant at 0.01 level of significance with degree of freedom, 1/72. It indicates that the adjusted mean scores of Interest in Mathematics of students taught through Mathematics club activities method and Traditional method differ significantly when pre Interest in Mathematics is taken as covariate. In the light of this the null hypothesis that "There is no significant difference in the adjusted mean scores of Interest in Mathematics of students taught through Mathematics club activities and Traditional method by considering pre Interest in Mathematics as covariate" is rejected.

Since the adjusted mean score of Interest in Mathematics of students taught through Mathematics club activities is 35.055 which is significantly higher than the adjusted mean score of Interest in Mathematics of students taught through Traditional method which is 30.890, it reflects that the Interest in Mathematics of the students taught through Mathematics club activities was found to be significantly superior to the students of Traditional method when both groups were matched with respect to pre Interest in Mathematics. It may therefore be concluded that Mathematics club activities was found to be superior to Traditional method in terms of Interest in Mathematics when groups were matched with respect to pre Interest in Mathematics.

The adjusted F-value of Personality is 0.770 which is not significant at 0.05 level of significance. It indicates that the adjusted mean scores of Interest in Mathematics of Extrovert and

Non Extrovert students did not differ significantly when pre Interest in Mathematics is taken as covariate. It reflects that there is no significant influence of Personality on Interest in Mathematics when pre Interest in Mathematics is taken as covariate. Thus the null hypothesis that "There is no significant influence of Personality on Interest in Mathematics of students when pre Interest in Mathematics is taken as covariate" is not rejected. It shows that both Extrovert and Non Extrovert students were found to be having same Interest in Mathematics when groups were matched with respect to pre Interest in Mathematics.

The adjusted F-value of Interaction between Treatment and Personality is 0.677 which is not significant at 0.05 level of significance. It indicates that there is no significant influence of resultant of Interaction between Treatment and Personality on Interest in Mathematics of the students when pre Interest in Mathematics of the students is taken as covariate, therefore the null hypothesis that "There is no significant influence of the Interaction between Treatment and Personality on Interest in Mathematics when pre Interest in Mathematics is taken as covariate" is not rejected. Therefore it can be said that Interest in Mathematics of the students was found to be independent of Interaction between Treatment and Personality when pre Interest in Mathematics is taken as covariate. It shows that irrespective of the nature of Treatment, the Interest in Mathematics of Extrovert and Non Extrovert students was found to be enhanced equally when groups were matched with respect to pre Interest in Mathematics.

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