Effect of Mastery Learning Approach (MLA) on the Achievement in Mathematics of students with Mathematical Difficulties

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Abstract: The research paper was aimed to find the effectiveness of Mastery Learning Approach (MLA) on the Achievement in mathematics of students with Mathematical Difficulties (MD). The researcher compared the effect of MLA and Conventional Method (CM) of teaching on the Achievement in Mathematics of students with Mathematical Difficulties. The pre-test, Post-test equal group experimental design was used for the present study. The sample of the study was selected by using simple random sampling technique. Sixty students of class 5th with MD were selected as the sample of the study from two randomly selected Govt. schools of Chandigarh. Those sixty students were further divided into two groups with thirty students in each control and experimental group. The tools used for the study were teacher referral form, and Achievement test in mathematics prepared by the researcher. The equal groups of students with MD were selected on the basis of previous two years academic record of mathematics, teacher referral forms and pre-test achievement test in mathematics. The statistical techniques used in study were mean, S.D. and t-test. The results revealed that MLA was more effective as compared to Conventional Method of teaching because there was a significant difference in the Pre-test and Post-test achievement scores of the experimental group.

I. INTRODUCTION

Education plays an important role in every aspect of life. It is an important tool for the all round development of the individual. It empowers our minds to conceive good thoughts and ideas. Intellectual development of individuals is one of the main achievements of education. We know very well that the world is full of diversities. The intellectual level of all the individuals is not same. This difference in cognitive level of students further affects their academic success. Sometimes it may be the fault of the teaching method .It is not possible for all individuals to learn with same pace. They may differ in their abilities and needs. Students lost their interest in particular subjects when a teacher teaches with the same old and boring methods of teaching. Traditional methods of teaching just promote rote memorizations they do not focus on conceptual learning (James & Alwan 2011). When we talk about a subject like mathematics, we cannot use those methods, which are just focus on memorization of formulae and concepts. Mathematics is a practical subject, students should know about the application of mathematical concepts and formulae in their daily life. Teacher centered methods cannot work in teaching of mathematics. Mastery learning is an approach of teaching mathematics where students can learn at their own pace and abilities (Damavandia & Kashani 2010). In this method, there are provisions for fast as well as slow learners. In this research paper researcher checked the effectiveness of Mastery Learning Approach in comparison to Conventional method of teaching.

Nature and History of Mastery Learning Approach

The Mastery-Learning concept was introduced in the American schools in the 1920's. Mastery learning was revived in the form of programmed instruction in the late 1950's in an attempt to provide students with instructional materials that would allow them to move at their own pace and receive constant feedback on their level of mastery. During the 1960's Bloom's learning for Mastery, focused new attention on the philosophy of mastery learning. He believed that by using this strategy, nearly all could learn excellently and truly masters the subject (Bloom 1971). The mastery learning method divides subject matter into units and each unit has a specific module to complete with predetermined objectives. In performing the unit tests, students should achieve mastery, before moving on to the following units. Students, who do not achieve mastery, receive remedial instruction and students who achieve mastery, have the opportunity to participate in enrichment

activities. With the use of the computers, mastery learning has a high potential to become an effective and extensive teaching and learning tool (Guskey, 1997).

Basic Elements of Mastery Learning Approach

Example of a Mastery Learning Approach
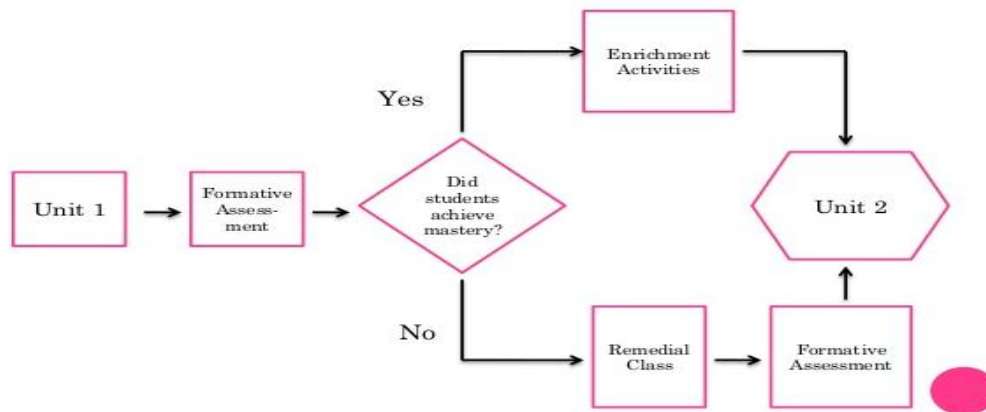
(liban, 2013)
I. Teacher's Presentation of first Unit
II.   First Formative assessment
III. Activities
a) Remedial Activities (For those students who did not achieve Mastery)
b) Enrichment Activities (For those students who achieved Mastery)
IV. Second Formative Assessment
V.   Teacher's Presentation of Second Unit

Rationale of the Study

The concept of Mastery Learning is not a new one in the field of education. In is based on the idea that all students can learn when appropriate teaching environment provided to them according to their abilities and needs. The students must achieved mastery on one concept before they allowed to progress to the next one. A single method of teaching cannot meet the needs of all students. In case of students with difficulties in a particular subject, it becomes more essential to choose an appropriate method of teaching. In mastery learning approach, students are given specific feedback about their learning progress at regular intervals throughout the instructional period. This feedback helps the students to know how much they achieved and in which field they still need to improve. Mastery learning makes the learning more effective and interesting. It emphasis on assuring that every student should achieves or 'masters' the curriculum and only then moves ahead to the new curriculum. It helps students to learn more content in less time. It also helps in developing learner's interest and attitude towards the subject. Therefore the effective teaching is possible only when we will consider the individual differences of all the students.

Review of Related Literature

Patriciah , W.& Johnson, M.(2007) accomplished a study on secondary school students which subtitled "Effects of Mastery Learning Approach on Secondary School Student's Physics Achievement". In this study Quasi-experimental and Solomon Four Non-equivalent Control Group Design was used. Purposive sampling technique was used to collect a sample of 161 students from four co-educational secondary schools. The students were instructed the same Physics topic of Equilibrium and Centre of Gravity. In the experimental groups Mastery learning approach (MLA) teaching method was applied while the Regular Teaching Method (RTM) was executed in the control groups. The tool used in the study was Physics Achievement Test (PAT) to measure students' achievement. The findings of the study showed that MLA teaching method concluded in higher achievement but gender had no significant impact on their achievement.
Telimoye, L. M. & Georgina, N.O. (2015) investigated the effect of Mastery Learning Approach on senior secondary school student's cognitive learning outcome in quantitative Chemistry. Quasi-Experimental Control group design was used for the study. Four secondary schools were randomly chosen and then assigned to

experimental and control groups. A total of 401 chemistry students were selected as sample for this study. The researcher find out that mastery learning is a quite effective methodology of teaching and successful than the traditional method of teaching. They further suggested that Chemistry teachers ought to be inspired to adopt it. Damavandia, M. E. & Kashani, Z. S. (2010) carried out a study titled "Effect of Mastery Learning Method on performance and attitude of weak students in Chemistry". This research was experimental in nature. Forty high school students as a sample of the study were randomly selected and further divided into two groups control and experimental with twenty students in each group. Experimental group was taught through Mastery Learning Method while control group by common method of teaching. The tools used for the study on both groups as pre-test and post-test were chemistry attitude questionnaire and academic achievement test. Multivariate variance analysis method was used to analyze the data. The results of the study revealed that Mastery learning method was more effective on performance of weak students in higher levels of learning method than in common learning method. Mastery learning method caused to increase positive changes in attitude of the weak students to chemistry learning.

Ram Mehar, R. & Rana, A. (2012) investigated in their study the effectiveness of bloom's mastery learning model on achievement in economics with respect to attitude towards economics. The sample of the study was selected from two CBSE affiliated schools of Chandigarh. Sample of hundred IXth class economics students was selected by purposive sampling technique from Government Senior Secondary School, Dhanas and Government High School, Sector 24, Chandigarh as fifty students from each school. Pre-test, Post-test factorial design was used for the study. The tools used for the study were Instructional Material prepared in accordance with the mastery learning model and conventional teaching method, Achievement Test in Economics prepared by the investigators and Attitude Scale towards Economics developed by the investigators. Analysis of variance was used to analyze the obtained data. The researchers deemed from the results of the study that:

- Mastery learning model group was found to attain significantly higher achievement scores as compared to control group
- Performance of students with attitude towards economics through mastery learning model was found significant
- No significant interaction effect was found to exist between the two variables.

Sood, V. (2012) worked on a research paper entitled "Effect of mastery learning strategies on concept attainment in geometry among high school students". The study was focused to find out the effect of mastery learning strategies and Kelle's Personalized System of Instruction on concept attainment in geometry among high school students in comparison to conventional method of teaching. To meet the pre-determined objective of the study a sample of 109 students studying in 9th class was selected. "Three Groups: Randomized Matched Subject Pretest-Posttest Design" was used to investigate the study. The sample of 109 students was divided into three equivalent groups on the basis o f intelligence of students. The first two groups were considered as experimental groups and were taught through Bloom's ML and Keller's PSI while the third group who was considered as control group was taught through conventional method of teaching. The tools used for the study were Concept Attainment Test in Geometry, Rave's Standard Progressive Matrices (SPM), instructional material based on Bloo's ML , Kelle's PSI and conventional method prepared by the researcher. The statistical technique of Analysis of Co-Variance (ANCOVA) was used to analyze the data. The results revealed that both Bloo's LFM and Kelle's PSI were significantly more effective in attainment of geometrical concepts as compared to conventional method of teaching. It was further concluded that Bloom's ML was significantly better in attainment of geometrical concepts in comparison to Kelle's PSI.

Statement of the Problem
"Effect of Mastery Learning Approach (MLA) on the Achievement in Mathematics of students with Mathematical Difficulties".

Operational Definitions:
Mastery Learning Approach

In Mastery Learning Approach each pupil attains mastery when he is able to give at least 80 percent correct response on a formative or summative test that has been constructed on the basis of instructional objectives with respect to that unit which each pupil is expected to achieve (Varughese , A. (2002).This is an instructional strategy that is designed to attain mastery of a learning task through variation of time and learning resources (Bloom. 1971).

Achievement

According to Oxford advanced learner dictionary of current English (2000) achievement is a thing that somebody has done successfully especially using his/her own efforts and skills.
In this study meaning of achievement in mathematics is to gains in knowledge in the content area of mathematics by students as measured by an outcome assessment (Koshy et al., 2009).

Mathematical Difficulties

Students with mathematical difficulty here means as those students who can learn but are misconceiving, developing error patterns, finding it hard to understand prescribed steps, having trouble in visualizing or misunderstanding instructions.

Objectives
* To compare the level of Achievement in Mathematics among both groups of fifth class students with Mathematical Difficulties before interventions.
* To study the effect of Mastery Learning Approach on Achievement in Mathematics of fifth class students with Mathematical Difficulties.
* To compare the effect of Mastery Learning Approach and Conventional Method on Achievement in Mathematics among fifth class students with Mathematical Difficulties.

Hypotheses
* There will be no significant difference between the levels of Achievement in Mathematics among both groups of fifth class students with Mathematical Difficulties before interventions.
* There will be no effect of Mastery Learning Approach on Achievement in Mathematics of fifth class students with Mathematical Difficulties.
* There will be no significant difference between the effect of Mastery Learning Approach and Conventional Method on Achievement in Mathematics among fifth class students with Mathematical Difficulties

Delimitations
* The study was delimited to Government model schools of Chandigarh.
* The study was delimited to the fifth class students with mathematical difficulties only.
* The study was delimited to three variables i.e. Mastery Learning Approach, Conventional method and Achievement in Mathematics.

Methodology

The present study was experimental in nature; it focused to study the effect of remedial programmes on Achievement in Mathematics. According to the objectives and nature of data required for the study, experimental design of research was considered appropriate for the present study. Therefore pretest- posttest equal group experimental design was used for the study.

Design of the Study
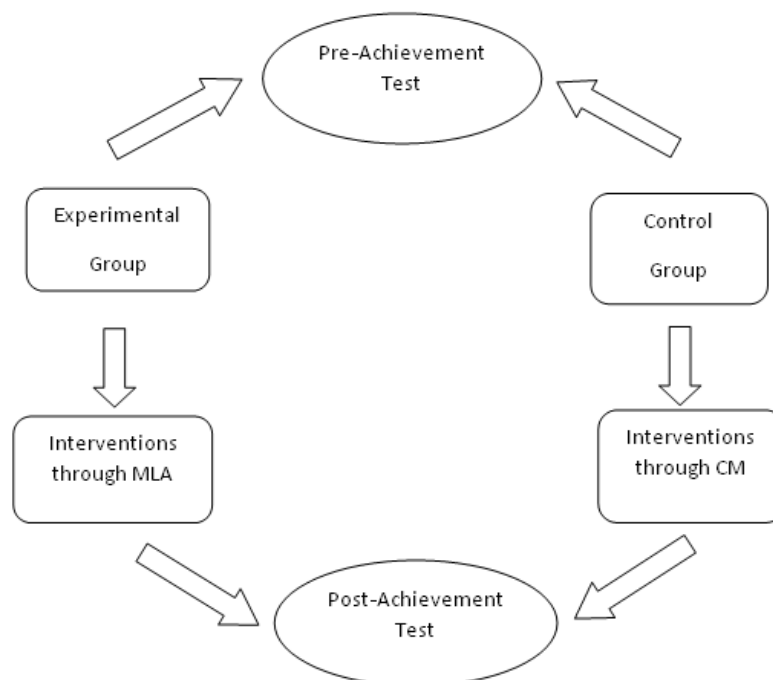
Sample

The sample of the study was selected from two Govt. Model schools of Chandigarh. Then 30 students of fifth class with mathematical difficulties were selected from each School (Govt. Model School, Sec-10 and Govt. Model School, Sec-15). Therefore the total sample of the study was 60 students of fifth class with Mathematical difficulties. Further these 60 students were divided into two groups one experimental and one control group with 30 students in each group. The students with Mathematical Difficulties were selected on the basis of two years mathematical academic record, teacher referral form and pre-test of achievement in mathematics conducted by researchers before interventions.

Tools

- Self prepared teacher referral form to select students with MD.
- Self prepared mathematical achievement test for class fifth students with MD.
- Teaching material by using MLA prepared by the researchers.

Data Collection

The researchers personally visited the two Govt. Schools of Chandigarh to collect the data from sixty students of fifth class with mathematical difficulties. First of all a rapport was build with the students and the teachers. The information collected from the teachers in the form of previous two year mathematical academic record of the students and teacher referral form was very effective for the researchers to know the difficulties of the students. The pre-Achievement test was administrated by the researcher on the both groups to assess the level of Achievement in Mathematics. After pre-test two weeks interventions were provided to the two groups by the researcher. Experimental group was provided interventions by using MLA and control group was taught with CM of teaching. In the last post-Achievement test was administrated to collect the final data.

Statistical Techniques

Descriptive statistics such as mean, standard deviation was used to ascertain the nature of distribution of the scores. Graphical representation was done wherever necessary. To compare the effect of MLA and CM t-test was used.

II. RESULTS AND DISCUSSIONS

I. Hypothesis: There will be no significant difference between the levels of Achievement in Mathematics among both groups of fifth class students with mathematical difficulties before interventions.

Table-I: Comparison of Experimental and Control groups in pre-test

Group	N	Mean	S.D.	t-value	Level of Sig. at 0.05
Experimental	30	13.60	1.71	0.698	Not –Significant
Control	30	13.00	2.10		

Table-I illustrated that there exists no significant difference (at the 0.05 level) between the levels of Achievement in Mathematics among both groups of fifth class students with mathematical difficulties before interventions. The calculated t- value for both the groups is 0.698, which is less than the table value i.e. 1.671. Therefore null hypothesis accepted and there exists insignificant difference between the levels of Achievement in Mathematics among both groups of fifth class students with mathematical difficulties before interventions.

II. Hypothesis: There will be no effect of Mastery Learning Approach on Achievement in Mathematics of fifth class students with mathematical difficulties.

Table-II (a): Comparison of pre-test and post-test scores of control group

Control group Scores	N	Mean	S.D.	t-value	Level of Sig. at 0.05
Pre-test	30	**13.00**	**2.10**	**-0.64**	**Not -Significant**
Post-test	30	**13.60**	**2.06**		

Table II (a) revealed that the t value of both pre-test and post-test scores of control group is -0.64. The tabulated t- value is 1.671, which is greater than the calculated value. This means null hypothesis is accepted and therefore there exists insignificant difference in the pre-test and post-test achievement scores of control group.

Table II (b): Comparison of pre-test and post-test scores of Experimental group

Experimental group Scores	N	Mean	S.D.	t-value	Level of Sig. at 0.05
Pre-test	30	**13.60**	**1.71**	**-3.21**	**Significant**
Post-test	30	**17.70**	**3.65**		

Table II(b) showed that there exists significant difference in the pre-test and post-test achievement scores of experimental group. The table value of t-test at 0.05 level of significance is 1.671which is less than the calculated value i.e. -3.21. Therefore there exists a significant difference between the pre-test and post-test achievement scores of experimental group. Hence our null hypothesis rejected and we can say that, there is a significant effect of Mastery Learning Approach on Achievement in Mathematics of fifth class students with mathematical difficulties.

III. Hypothesis: There will be no significant difference between the effect of Mastery Learning Approach and Conventional Method on Achievement in Mathematics among fifth class students with mathematical difficulties

Table-III: Comparison of Experimental and Control groups in post-test

Group	N	Mean	S.D.	t-value	Level of Sig. at 0.05
Experimental	30	**17.70**	**3.65**	**3.09**	**Significant**
Control	30	**13.60**	**2.06**		

Table III revealed that the calculated t- value is 2.62. The tabulated t-value is 1.671, which less than the calculated value i.e. 2.62. Hence null hypothesis rejected and there exists a significant difference between the effect of Mastery Learning Approach and Conventional Method on Achievement in Mathematics among fifth class students with mathematical difficulties.

Fig 1: Mean and S.D. of Experimental and Control groups in post-test
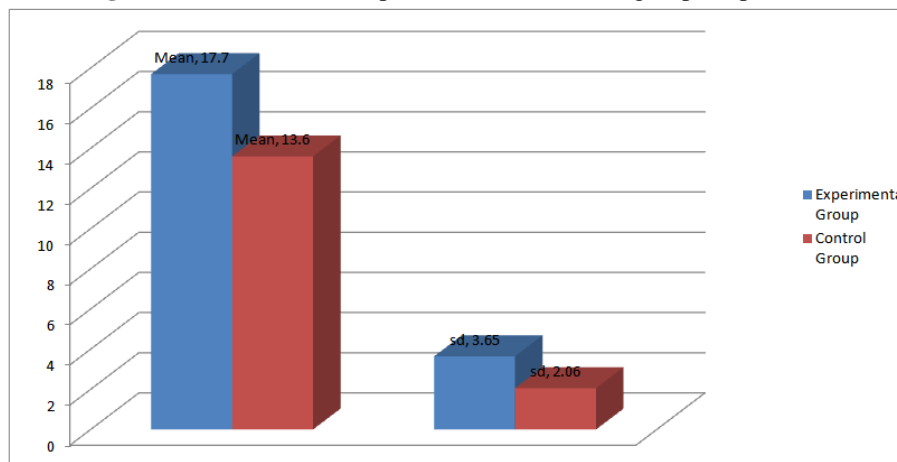
IV. CONCLUSIONS

The results of the study clearly revealed that there is significant difference in the pre and post achievement scores of experimental group. The post achievement scores of experimental group were also significantly higher as compared to control group. The experimental group was taught through the MLA where as the control group was taught through the CM of teaching. The results illustrated better learning in experimental group which was taught through MLA. Therefore we can conclude from the results that MLA is quite effective for teaching mathematics to students with mathematical difficulties.

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