Effectiveness of Mastery Learning Strategy on Learning Achievement in and Attitude towards Mathematics in relation to Cognitive Style

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Abstract : *The present study is an attempt to know the effect of mastery learning strategy on achievement in and attitude towards Mathematics on the basis of cognitive style. The sample comprised of 120 class IV students. They were categorized into two groups i.e. analytic and global as per their cognitive style scores. The students were randomly assigned further into two groups, i.e. experimental and control, each consisting of 60 students. Attitude towards Mathematics Scale (ATMS), formative tests, pre achievement and post achievement test in Mathematices were used. Percentage, 't' test and ANOVA were used to analyse the data. The results indicated that the students taught through mastery learning strategy had high mean achievement score in mathematics and showed favourable attitude towards Mathematics as compared to that of mathematics. Cognitive style had also a significant effect on the attitude towards Mathematics and Mathematics achievement.*

Keywords: *Mastery Learning Strategy (MLS), Cognitive Style (CS).*

Rationale of the Study

National Policy on Education (NPE, 1986) and Programme of Action (POA, 1992) recommended that implementation of Minimum Levels of Learning (MLL) at primary level to improve the quality of education. MLL is nothing but the application of Bloom's Mastery Learning Strategy (MLS). All students can masters what teachers teach in all classrooms. The instructional variables can be easily manipulated such that all most all students achieved the prescribed degree of mastery (Bloom, 1968). Besides, various factors also affect the achievement of students. Any students can become a master, but the efforts and remedial instructions will definitely vary as per their Cognitive Style (CS). Again attitude towards subject is a function of achievement also. The students who secure high marks in a subject have favourable attitude where as the students who have unfavourable attitude, secure poor mark. As the MLS ensure mastery level of achievement by each and every students this in turn will definitely change the attitude of the students towards the subject. Hence, there is a need to be implementation of MLS for teaching different subjects starting from elementary level.

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It is most amazing to note that some of the studies (Lin 1982, Myer and Hensly 1984, Gill and Kaur 1990, Panda 1991, Viney 1992, Hota 1994; Mehra andThakur 2008) reflects better performance of analytic students while some other studies (Shrivastav 1992, Venugopal 1994 and Devi 1999) reflects no significance in achievement among analytic and global students. The study of (Mohanty, 2008) reveals that global students perform better in Biology than the analytic students. The studies conveyed that MLS affects the achievement and attitude towards the subjects like Science, History, Mathematics, Hindi and Statistics where as MLS have no significant effect on the achievement and attitude towards English Grammar (Chaudhari, 1989). These findings seems to be contradictory. So, it is a pertinent research question whether MLS effect on the achievement in and attitude towards Mathematics of elementary school students with reference to cognitive style or not.

Objectives of the Study

    i.   To study the effectiveness of Mastery Learning Strategy (MLS) on the learning achievement in Mathematics among elementary school students with reference to their Cognitive Style (CS).

    ii.   To study the effectiveness of MLS on the attitude of elementary school students towards Mathematics.

    iii.   To study the effectiveness of MLS on the attitude towards Mathematics among elementary school students with reference to their Cognitive Style.

Hypotheses

On the basis of stated objectives, the following null hypotheses were formulated.

H_{01} There is no significant difference between the experimental and control groups in the mean gain score of achievement test in Mathematics among elementary school students.

H_{02} There is no significant difference in the mean gain score of achievement test in Mathematics between the analytical and global groups of students.

H_{03} There is no significant difference in the mean attitude score in Mathematics among elementary school students belonging to experimental and control groups.

H_{04} There is no significant difference in the mean score on attitude towards Mathematics between the analytical and global groups of students.

Methodology

Experimental Design

Pre-test post-test control group design

Sample

The sample comprised of 120 class IV students selected from 158 students of selected two elementary schools. On the basis of CEFT scores, they were categorized into two groups i.e., analytical and global. The students were randomly assigned further into two groups i.e., experimental and control group. Each group consisted of 60 students.

Tools used

The following tools were used in the present study:

    i. Children Embedded Figure Test (CEFT) of Karp and Konstadt (1963) was used to measure cognitive style.

ii. Attitude towards Mathematics Scale (ATMS) of Gakhar and Rajni (2004) was used to know their attitude towards Mathematics.

iii. Formative tests were used to identify the masters and non-masters.

iv. Achievement tests (pre-test and post-test) were used to know learning achievement in Mathematics.

Procedure

The study was carried out in the three phases, i.e., pre-testing, implementation of independent variable and post testing. One unit was selected from Class VI Mathematics book i.e., "Percentage". This unit consists of four subunits. The competencies of this unit were identified. Competency based instruction was provided. During instruction formative tests were used in order to identify the number of masters and non-masters. Remedial instructions were given to the non-masters.

Statistical Analysis

The study was a factorial experimental design. So, the obtained data were subjected to statistical analysis like Mean (M), Standard Deviation (SD), Test of Significance ('t' test), Analysis of Variance (ANOVA) and Percentage Analysis etc.

Results

A. Effect of MLS on the achievement in Mathematics

In order to know the effectiveness of MLS an achievement test was administered to all student at the end of experiment. The results are summarized as follows:

Table 1: The Gain Scores of the Achievement Test of Experimental and Control Groups

N=60

Groups	M	SD	t- value	P
Experimental	17.66	4.58	24.16	0.01
Control	1.47	2.54		

In order to verify the significance of experimental treatment, the gain scores were obtained by subtracting the pre-test scores from the post-test scores. The 't' value was significant. Hence, the null hypothesis i.e., "there is no significant difference between the experimental and control groups in the mean gain score of achievement test in Mathematics among elementary school students" was rejected.

This happened because of the reason that during MLS, care was taken for individualized instructions within the context of group instructions. During the teaching period criterion referenced formative tests enabled the investigator to diagnose the learning difficulties of the non-masters. The masters were engaged to clarify the doubts of non-masters. This conclusion is supported by the findings of Hooda (1982), Yadav (1984), Koul (1986), Chaudhari and Vaidya (1988), Vaidya (1990) , Budhdev (1991), Despande and Bhat (1994), Tripathy (1996), Gakhar and Agarwal (2002).

B. Effect of MLS on the Achievement in Mathematics with reference to Cognitive Style

Table 2: Summary of ANOVA: Gain Scores of Achievement Test in Mathematics with Reference to CS

Sources of Variation	DF	SS	MS	F	P
A (Treatment)	1	7873.20	7873.20	604.22	0.01
B (Cognitive Style)	1	132.30	132.30	10.15	0.01
A × B	1	7.50	7.50	0.57	NS
Within Group	116	1512.46	13.03		
Total	119	9525.46			

The table 2 depicts that the main effect of treatment was significant at 0 .01 level. Further the table indicates that the main effect of CS was also significant at 0.01 levels and the interaction effect (treatment × CS) was not significant. The 't' test was done to know the difference among different groups of students with reference to their CS.

Table 3: Test of Significance (t-test) for the Main Effect of Treatment on the Achievement in Mathematics during Pre-test and Post-test

N = 30

Groups	t- value	P
EA vs. CA	16.52	0.01
EG vs. CG	17.26	0.01

Table 3 shows that the 't' values were significant at 0.01 level for all the groups considering their CS. It indicates that both the analytic and global students performed better in Mathematics achievement test during post test than their control group counterparts.

Table 4: Test of Significance (t-test) for the Main Effect of CS on the Achievement in Mathematics during Pre-test and Post-test

Groups	t-value	P
EA vs. EG	2.15	.05
CA vs. CG	2.59	.01

The 't' values were estimated in order to determine the significant mean difference among the various groups in relation to CS. The analytic students performed better than the global students belonging to experimental as well as control groups. Cognitive styles are the intellectual characteristics of the individual and it refers the consistencies in individual modes of functioning. That is reflected in a variety of behavioural situations. It involves perceptual process, learning, problem solving ability etc. Thus, the cognitive style had a significant influence on the achievement of the students. Again the

students of experimental analytic group were performed better than their counterparts. The analytic students were able to organize the facts systematically. MLS approach was systematic and organized, focusing various cognitive abilities. Because of these instructional procedure and style of thinking and learning also facilitated the analytic students to achieve more.

Table 5: Test of significance (t-test) for the interaction effect of Treatment and Cognitive style on the Achievement in Mathematics during Pre-test and Post test.

Groups	t- value	P
EA vs. CG	26.62	0.01
EG vs. CA	15.84	0.01

The table 5 indicates that the 't' values were significant for all the groups. The analytic and global students belonging to experimental group had performed better than their counterparts belonging to control group. This is due to treatment. From the analysis it is clear that the null hypothesis i.e., "there is no significant difference in the mean gain score of achievement test in Mathematics between the analytic and global groups among elementary school students" is rejected

The reason for the significant difference between analytic and global students was attributed to the fact that cognitive styles are the intellectual characteristics of the students. Thus, MLS didn't reduce the influence of individual difference with reference to cognitive style. It is because of the fact that all the students with global cognitive style have either average or low level of intelligence. Thus, it is concluded that the achievement in Mathematics is a function of cognitive style of the students irrespective of the treatment. This finding is supported by (Lin 1982, Myer and Hensley 1984, Gill and Kaur 1990, Panda 1991, Viney 1992, Hota 1994, Mehra and Thakur 2008).

C. Effect of MLS on the Attitude towards Mathematics among Elementary School Students

Table 6: Attitude Scores in Mathematics among Experimental and Control Groups during Pre-test and Post-test

Treatment	Tests	M	SD	t-value	P
Experimental	Pre-test	133.10	16.35	9.08	0.01
	Post-test	166.55	23.37		
Control	Pre-test	132.53	16.82	0.15	NS
	Post-test	133.78	17.29		

Table 6 shows that the conventional method did not affect the attitude towards Mathematics among elementary students as 't' value is not significant for control group. From analysis of the data it has become clear that the null hypothesis i.e., "there is no significant difference in the mean score on attitude towards Mathematics among elementary school students belonging to experimental and control group " is rejected and the alternate hypothesis i.e., "the students belonging to experimental group have significantly greater mean score on attitude towards Mathematics than the control group among elementary school students" is accepted.

This is happened because the MLS was a systematic and deliberate learning process in which each student actively participated and enjoyed the learning. Immediate feedbacks followed by teaching either by the teacher or by the peer to NMs improved their learning and the free interaction facilitated them to become masters. It was also experienced during the experiment that because of the remedial instructions by the peers or by the investigator as well as the individualized attention enable the students to become free and clarify their doubts. This helped them to attain mastery over the contents. This finding is supported by Khan (1961), Russell (1969), Yadav (1984), Chaudhari and Vaidya (1988), Vaidya (1990) Budhadev (1991), Thankam (1997).

D. Effect of MLS on the Attitude towards Mathematics with Reference to CS

Table 7: Test of Significance (t-test) for the Main Effect of Treatment on the Attitude towards Mathematics during Post-test.

Groups	t-value	P
EA vs. CA	6.18	0.01
EG vs. CG	7.16	0.01

The observation of table 7 shows that 't' values were significant at 0.01 level in two cases. The MLS affect the attitude of students in relation to their cognitive style. The analytic as well as global students belonging to experimental group have higher mean attitude value in comparison to their control group counterparts.

As the main effect of treatment was significant and in order to strengthen this result, 't' values were calculated among various groups in relation to cognitive style. The same is presented in table 8

Table 8: Test of Significance (t-test) for the Main Effect of CS on the Attitude towards Mathematics during Post-test

Groups	t-value	P
EA vs. EG	2.73	0.05
CA vs. CG	2.81	0.01

It is observed from the table 16 that in case of experimental group there was significant mean difference between the analytic and global students. The 't' value was significant at 0.05 level. The mean difference between the analytic and global students of control group was also found significant at 0.01 level. It further indicates that a true difference exists between the mean attitude scores of analytic and global students irrespective of the treatment. Therefore, the null hypothesis i.e., "there is no significant difference in the attitude towards Mathematics between the analytic and control group among elementary school students" is rejected.

The result thus obtained is because of the fact that analytic students are more intelligent and they have high degree of analyzing and synthesizing capacity to do numerical problem easily and quickly than the global students. The investigator has also experienced during the treatment that all students with global type have either average or low level of intelligence. This finding is supported by Viney (1992).

Major Findings

i. The MLS is more effective in facilitating learning and raising the achievement in Mathematics than the conventional method.

ii. The CS had also significant influence on the achievement in Mathematics. The analytic students performed better than the global students due to instructional treatment on the basis of MLS.

iii. The MLS was more beneficial to the students in changing their attitude towards Mathematics subject than the conventional method of instruction.

iv. The CS had significant effect in changing the attitude towards Mathematics. The analytic students had more favourable attitude as compared to global students.

Educational Implications

i. MLS is very much effective to strengthen teaching learning process.

ii. MLS proves to be vital for capacity building of teacher educators and teachers.

iii. MLS creates individualized instruction in large lecture classes.

iv. MLS provides an orientation to the practitioners to conduct action research.

v. It provides a base for planning and implementation of quality improvement interventions.

vi. The upper primary and secondary level curriculum may be developed and arranged in fulfilling the competencies on the basis of MLS approach.

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