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Learning Experiences and Scholastic Achievement of School Students in Mathematics – Role of Intervention

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ABSTRACT

The present study examined the influence of intervention incorporating multiple intelligences on learning experiences and scholastic achievement of secondary school students. Data was collected from 208 students of 6th grade by following two stage sampling technique. Data was subjected to statistical analysis using chi-square, 't' test and wilcoxon signed rank test. It was observed that in class rooms in which teacher incorporates multiple intelligences in teaching practices the students showed more interest in mathematics and also showed higher scholastic achievement. It has been recommended to follow the same teaching approach to generate interest among students in mathematics.

Keywords: *Learning Experiences, Mathematical Performance, Multiple Intelligences,*

Although scientific and technological developments are mathematics based many students continue not only to perform poorly in mathematics, but also have a sense of fear and dislike towards mathematics. Hence, they give up early on and dropout of serious mathematical learning. As children learn in variety of ways (National Curriculum Frame work, 2005) through experience, making and doing things, experimentation, reading, discussion, asking, listening, thinking and reflecting and expressing oneself in speech, movement or writing both individually and with others. They require opportunities of all these kinds in the course of their development. Rich and stimulating learning experiences are needed for children's optimum achievement. According to Pamela Lie beck (1984) children need the emotional stimulus of real materials and problems in which they feel interest and involvement.

In the study the role of teaching practices in the development of children's interest in reading and mathematics 'Marjia Kristina and Lerkanen (2012) found that when teachers placed greater emphasis on child centered teaching practices than on teacher directed practices, the children showed more interest in reading and mathematics. Iulianna Marchis (2011) in the study. "Factors that influence secondary school students attitude to mathematics" observed that students could

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like, enjoy or the opposite could hate mathematics. There is a correlation between students attitude to mathematics and their mathematics results. Thus it is important to develop a positive attitude towards learning mathematics. This attitude can be influenced by many factors including learning experiences.

In the study conducted by Douglas, Onik; Burton, Kimberly Smith and Durham, Nancy Reese (2007) examined the effects of multiple intelligences teaching strategy on the academic achievement of eighth grade mathematics students. The findings of the study revealed that the students who are taught in an environment utilizing multiple intelligences strategies achieved higher academic maths test scores than those students who did not. The studies conducted by Temur, Ozlem Dogan (2007) Dannen hoffer, Joanv. and Radin, Robert J. (2005) have also revealed similar findings.

Against this context, the present study examined the influence of intervention incorporating multiple intelligences on learning experiences and scholastic achievement of secondary school students.

OBJECTIVES

The objectives of the present study are:

1. To assess the learning experiences of students in mathematics
2. To study the impact of teaching activities prepared according to multiple intelligences theory on learning experiences of students.
3. To compare the mean achievement scores of scholastic achievement test before and after intervention.

Hypothesis

1. Students learning experiences and scholastic achievement are influenced positively by the teaching learning activities prepared according to multiple intelligences theory.
2. The performance of students could be improved significantly by the intervention incorporating multiple intelligences.

METHODS

Research design

This is a primary research covering sixth grade students from Urban and Semi urban schools

Sample

A non probability sample of 208 students of which 120 boys and 88 girls were selected from 7 schools of Hyderabad and Ranga Reddy districts of Telangana State. Two stage sampling technique was followed to select the sample. In the first stage randomly 7 schools were selected. In the second stage 32 students of sixth grade were selected randomly from each school. 16

students were dropped from the study on various reasons (irregularity, not showing interest etc.) So, the data related to 208 students (out of 224) was subjected to in house data analysis.

Research tools

Research tools included a personal data sheet, student's interview questionnaire and scholastic achievement test in mathematics. Personal data sheet was used to collect information like gender, community, family income per month. Student interview questionnaires were used to gather information on learning experiences of mathematics before and after intervention. Scholastic achievement test was used to measure scholastic achievement before and after intervention.

Intervention Process

The intervention Process included teaching mathematics incorporating multiple intelligences (Logical Mathematical Intelligence, Linguistic Intelligence, Interpersonal Intelligences, Intrapersonal intelligence, Naturalistic Intelligence, Bodily Kinesthetic Intelligence, Spatial intelligence and Musical Intelligence).Due to space constraints this process is not elaborated.

Procedure

Research was conducted after taking permission from the school authorities and obtaining consent from the students. After fixing the tentative time schedule for the study, data was collected from the students before and after intervention.

Data Analysis

Data was analysed by using statistical techniques chi square, 't' test and wilcoxon signed rank test

Ethical issues followed

A written consent was taken from the school authorities to conduct the study. Similarly an oral consent from the students was taken. The freedom to withdraw from the study at any stage was given to school authorities and students. Confidentiality of the data was assured. Finally data was collected from the students with the help of research tools (self administered questionnaires)

RESULTS

The results were presented under two sections (section I & II) Section I consists of sample and learning experiences of mathematics and section II consists of scholastic performance of students in mathematics.

Section I

Table No.1, Showing distribution of sample (N=208)

Category		Sample size	Percentage	Total
Gender	Boys	120	58	208
	Girls	88	42	
Community	BC	74	36	208
	SC	62	30	
	ST	30	14	
	OC	42	20	
Family income per month (in rupees)	Upto 5,000	63	30	208
	5,000-10,000	88	42	
	Above 10,000	57	28	

From the above table No. 1. It is evident that out of 208 students 120 are boys (58%) and 88 are girls (42%). Community wise BC's are 36% and SC's are 30%. The ST and OC are 14% and 20% respectively. 42% of the families belong to income group of Rs. 5,000 – Rs. 10,000 and 30% families up to Rs. 5,000 income per month. 28% of the families belong to income of above Rs. 10,000 per month.

Table No.2, Showing students learning experiences of mathematics (N=208)

Learning Experience		Pre intervention	Percentage	Post Intervention	Percentage	Chi-square
Fear of mathematics	Yes	113	54	20	10	10.4*
	No	95	46	188	90	
Enjoying mathematics	Yes	68	33	188	90	10.7*
	No	140	67	20	10	
Feeling towards mathematics (Interesting)	Yes	72	35	186	89	13.02*
	No	136	65	22	10	
Like to do maths homework	Yes	84	40	182	88	17.34*
	No	124	60	26	12	

*Significant at 0.01 level

From the above table No. 2 it can be observed that 113 (54%) students before intervention expressed that, they have fear of mathematics. After intervention 20(10%) students expressed fear of mathematics. The number of students who expressed that they enjoy mathematics and they like to do maths s home work were 68 (33%) and 84 (40%) respectively before intervention. The corresponding values after the intervention were 188 (90%) and 182 (88%) respectively. It was also observed that 72(35%) students shown interest in mathematics before intervention and 186 (89%) students after intervention. Chi square values indicate that the results are significant.

Section II

Table No. 3, Showing comparative performance of students scholastic achievement test marks (N=208)

Intervention	N	Mean	SD	T Value
Pre test	208	12.6	5.3	17*
Post test	208	17.3	5.8	

*Significant at 0.01 level

From the above table No. 3 it can be observed that the mean scores of students before and after intervention are 12.6 and 17.3 respectively for the SD values of 5.3 and 5.8. 't' value indicate that the results are significant.

Table No.4, Showing students comparative performance on wilcoxon signed rank test (N=208)

		N	Percentage	Mean Rank
SAT post intervention (-) SAT pre intervention	Negative Ranks	19[a]	9%	37.58
	Positive Ranks	178[b]	86%	105.56
	Ties/ Same Ranks	11[c]	5%	
	Total	208		

*SAT : scholastic achievement test
a: SAT post intervention < SAT pre intervention
b: SAT post intervention > SAT pre intervention
c: SAT post intervention = SAT pre intervention

From the above table No. 4 it can be observed that 19 students SAT post intervention ranks are less than SAT pre intervention, 11 students SAT post intervention and pre intervention ranks are same and 178 students SAT post intervention ranks are better than SAT pre intervention ranks.

DISCUSSION

Many significant studies on multiple intelligences theory have been undertaken, but on applying multiple intelligences theory to the teaching of mathematics are relatively less. The effectiveness of multiple intelligences theory is supported by the findings of a study conducted by Hardward's project zero (Hoerr, Thomas 2011). In interviewing the principals of 41 schools using multiple intelligences approach of teaching, 78% of them said that their schools had realized gains on standardized achievement scores and 63% attributed the growth to practices inspired by multiple intelligences theory. Studies point out that when learning opportunities are combined by the curriculum by using multiple intelligences students understanding will be better and scholastic achievement will be more (Gardner, 1997, 2006). The results of the present study are in tune with the findings of other studies, as mentioned above.

The first hypothesis predicted that students learning experiences and scholastic achievement are influenced positively by teaching learning activities prepared according to multiple intelligences theory. Table No. 2 presents the influence of the intervention programme. The percentage of students who had fear of mathematics decreased (54% to 10%) after the intervention and the percentage of students who enjoy mathematics increased (33% to 90%) after the intervention. It is also observed that the percentage of students who perceived mathematics as an interesting subject increased from 35% to 89% and the percentage of students who like to do mathematics home work increased from 40% to 88% after the intervention. Table No. 2 clearly indicates that chi square is significant at 0.01 level of significance for all the learning experiences of mathematics indicating the positive influence of the intervention. From table No. 2 it can be inferred that the number of students who had fear of mathematics decreased significantly 113 (54%) to 20(10%) after the intervention and number of students who enjoy mathematics increased significantly 68 (33%) to 188 (90%) after the intervention. Similarly the number of students who like to do mathematics homework increased significantly [84 (40%) to 182 (88%)]. The results indicate the effectiveness of the intervention.

The second hypothesis of the study predicted that the performance of students could be improved significantly by incorporating multiple intelligences.

Table no. 3 presents the comparative performance of students scholastic achievement marks. Mean scores of students after the intervention (17.3) is higher than the mean scores of students before intervention (12.6). There is a significant difference in the performance of students who have gone through intervention incorporating multiple intelligences. This is evident from the 't' value (17) which is significant at 0.01 level.

Table No. 4 indicates that out of 208 students 178 (86%) students improved their performance after the intervention, which is evidenced from improved ranks. The mean rank for positive ranks is 105.6 and for negative ranks 37.6. It indicates that there are more high ranks for the positive differences. Which means improvement in their learning.

CONCLUSION

The present study suggested that learning experiences and scholastic achievement of secondary school students in mathematics influenced positively by incorporating multiple intelligences in teaching mathematics. The intervention helped the students to improve interest in mathematics, to overcome fear of mathematics and to score higher in mathematics scholastic achievement test.

RECOMMENDATIONS

1) Awareness and training programmes may be conducted for teachers on using multiple intelligences theory in teaching mathematics.
2) Teachers can be trained to design curriculum incorporating multiple intelligences.
3) Students may be made familiar with multiple intelligences and ways to incorporate in learning mathematics.
4) The study to be conducted in rural schools for the benefit of larger section of students population of this country.

IMPLICATIONS

The findings of the present study have clear implications for teachers to adopt new way of teaching mathematics. There is a need to place greater emphasis on child centred teaching practices (like incorporating multiple intelligences) than on conventional practices to improve students interest and performance in mathematics.

LIMITATIONS

The findings of the present study are limited in the sense that the sample (208) comprised of only urban and semi urban students of sixth grade. In order to be able to make more meaningful generalisaitons about the intervention, further studies should focus on more heterogenous samples (urban, semi urban and rural) of larger size

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