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Computer Teaching Strategy For Mathematical Disabled School Children: An Experimental Study

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Abstract: The present study gives importance to special strategy (computer-assisted instruction, CAI) for teaching the mathematical disabled children. This study was investigated in a town (including urban and rural area). Study included forty (40) participant of class-III level from government school who were mathematically disabled. They were randomly divided into matched group (experimental and control) with twenty (20) participants each. Mean, Standard Deviation and t-test were employed for data analysis. The result indicated that the use of computer-assisted instruction have an effect on mathematical disabled children. The result concluded that the early use of the strategy helps to gain improvement in mathematical skill.

Keyword: Computer-assisted instruction; elementary level mathematical disability; mathematical symbols.

INTRODUCTION:

Mathematics has been regarded as a universal language and a symbolic language which enables people to think about records and providing ideas concerning the elements in relationships to quantity. The scope of mathematics includes the ability to think in quantitative term, as well as the operations of counting, measurement, arithmetic, calculation, geometry and algebra (Lerner, Janet W., 2000, pp 484). Mathematics is referred as difficult area for many students, but students with mathematical disorder have much more difficult than others of his or her age. Miller, Butler and Lee (1998); Rivera (1997) studies estimated that about twenty six (26) percent of students with learning disabilities receive assistance for problems in mathematics. Dyscalculia is a medically oriented term that describes a severe disability in learning and using mathematics (Lerner, Janet W., 2000, pp 484). Dyscalculia affects the brain's ability to process and understand the meaning of numbers. Rourke and Conway (1997) study views that analogous to dyscalculia is described as a specific disturbance in learning mathematical concepts and computation associated with a central nervous system dysfunction. A child with a math-based learning disorder struggles with memorization and organization of numbers, operation signs and number facts (example they read 3+3=6 as 3x3=9; write 3 as E). Children with mathematical disorder even have poor sense of direction and time (Lerner Janet, 1998, pp 434). These children have difficulty in keeping score during games and have limited ability to plan moves during games like chess. It is often seen that a number of different skills are impaired with mathematical disorder, such as 'linguistic skill' (understanding or naming mathematical terms, operation or concept and decoding written problems into mathematical symbols), 'perceptual skill' (recognizing or reading numerical symbols or arithmetic signs and clustering objects into groups), 'attention skill' (copying numbers or figures correctly, remembering to add in carried numbers and observing operational signs) and 'mathematical skill' (following sequences of mathematical steps, counting objects and learning multiplication tables) (Laura Stephens,2006).

The Individuals with Disabilities Education Act (IDEA) of 1997 has specified two mathematics problem areas for students with learning disabilities these are: mathematical calculation and mathematical reasoning; it is viewed that these two areas interfere with achievement in school and success in life (Lerner, Janet W.,2000, pp 484). The present study is concerned with mathematical calculation only. Calculation difficulties are quite common in children with mathematical disability. These children are often found unable to learn how to perform certain calculation while making the same mistakes repeatedly. Difficulty with calculation is known as 'anarithmetica' (Badian, 1983). Generally, it is seen that as soon as a child enters school formal arithmetic instruction begins, where the child is expected to master the mathematical operation. The basic mathematical operations are addition, subtraction, multiplication and division. Ward's (1979) survey showed many 10- year old children have problems with calculations. Children often confuse or misapply arithmetical operation or may have memory problems, these two reasons may be regarded as the cause for making mistakes in calculating. Joffe (1980) in his study gave an example of a child who begins by selecting the correct operation but later on changes one-half to another through the calculation. Confusion in reading and writing of the numbers and symbols leads to incorrect calculation. Children with mathematical disability mostly unable to recognize the mathematical symbols which are used, such as (`+' for addition), (`-' for subtraction), (`x' for multiplication) and (`/'for division). Johnson and

Myklebust (1967) study noted that the difficulty with reading and writing numbers mostly affects the number 2,3,5,6 and 9. Children often misread and write mathematical operation, the study by Badian (1983) found that an incorrect algorithm is due to confused operation. Thus, various studies have revealed that incorrect mathematical operations for period of time may lead child to mathematical disability, but with careful observation and analysis it can be prevented.

Mc Leod and Crump (1978) found that about one-half of students with learning disabilities require supplemental work in mathematics, although only ten (10) percent were seriously deficient in mathematics. Sheldon Horowitz at the National Centre for Learning Disabilities viewed that carefully designed practice can improve math skills. There are various technologies for mathematics instruction among which computer play an important role in teaching mathematics to learning-disabled student. Cosden, Gerber, Semmel, Goldman and Semmel (1987) study found that learning-disabled students use the computer more frequently for math instruction than for any area of the curriculum.

Elementary level is been regarded as the milestone in a life of every children. Children with learning disabilities are recognize in school when they starts failing in their academic areas. Early intervention prevents the children from disabilities. Schonell (1937) wrote about the importance of sound foundation in arithmetic and the need for early diagnosis of arithmetic problems in order to prevent 'far reaching emotional handicaps'. Parents, teacher along experts with balanced program and strategies in suitable classroom environment may help in teaching mathematics to mathematical disabled children.

Hence, the researcher conducted the present study upon the mathematical disabled children in a town (including both urban and rural area). The study was conducted on class-III children of government school. The researcher has taken lower class because it is viewed that elementary level is main foundation of a child and it is the first step of the child's formal education where instruction with computer makes teaching process more effective and interesting for mathematical disabled children

Objectives of the study:1. To recognize and use mathematical symbol through computer assisted technique.

2.To find out the difference among urban and rural children in recognition and use of mathematical symbols through computer assisted technique.

HYPOTHESIS OF THE STUDY:

1. Computer-assisted strategy will have affect on recognition and use of mathematical symbols.
2.Computer-assisted strategy will have affect on mathema tical disabled children of both urban and rural area.

REVIEW OF PREVIOUS STUDIES:

Many individuals with mathematical disability have major problems in their way to success. Number of researchers has done their studies in relation to the mathematical areas.

Adelman and Vogel (1991); Patton, Cronin, Bassett and Koppel (1997) studies revealed that mathematics is not only a problem in school, but it also continues to impair adults in their daily lives. Geary (2004), Gross Tsur, Manor and Shaler (1996) studies estimated that mathematical learning disability affect five to eight percent of school age children. Lerner (1997) study revealed that children learned the basic signs of the four basic arithmetic operations, through calculator which assist in accomplishing the calculation needed to solve mathematical concepts. Lewis (1998); Raskind and Higgins (1998) studies revealed that computer motivate students and the mathematical software programs individualizes, provide feedback and offers repetition. Micallef and Prior (2004) found that mathematics is being recognized as an academic area in which learning disability occurs. Sherand and Quadling (1980) revealed that boys are higher attainders than girls at the end of schooling at least as far as math are concerned. Shulev, Manor, Auerbach, and Grodd Tour (1998); Miller and Mercer (1997); Deshler, Ellis and Lenz (1996) studies found that the mathematics difficulties emerge in elementary school continue through the secondary school years. Woodward (1998) suggests that the World Wide Web can be used to teach mathematics to students with learning disabilities.

METHOD:

The present study is an experimental study, where true experimental design with purposive sampling technique was used to collect the data. Forty (40) mathematical disabled children were selected from four government aided schools which were randomly selected from rural area and from urban area. Sample was divided into two groups (experimental and control), and these children were selected on the basis of self-made standardized tools.

Instrumentation: Intelligent test questionnaire contained five items—(A). Identification of time through pictures (marks-20); (B). Choosing the correct mathematical symbols (marks-20); (C). Writing the numbers in words (mark-20); (D). Addition (mark-20); (E). Subtraction (mark-20). The total score of the test is 100. First Questionnaire for Mathematical Disabled children contained five items--- (A) Greater/Lesser than (mark-20); (B) Joining of number in increasing and decreasing order (mark-20); (C) Match of the following (mark-20); (D) Fill-in-the blanks with number and symbol (mark-20) (E) Addition and Subtraction (mark-20). The total mark of the questionnaire was 100 and Second Questionnaire for Mathematical Disabled children this questionnaire contained the same five items as first questionnaire-(A) Greater/Lesser than (mark-20); (B) Joining of number in increasing and decreasing order (mark-20); (C) Match of the following (mark-20); (D) Fill-in-the blanks with number and symbol (mark-20) (E) Addition and Subtraction (mark-20). The total mark of the questionnaire was 100. These tools were developed by the investigator which were been standardized before the study was conducted. But no standardized questionnaire was used to collect data for academic achievement of the students, school records were the only source.

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Procedure: As the medium of instruction in selected school was Bengali, hence the questionnaires were formatted in Bengali version only. The study was conducted in three phases for the collection of the data.

First phase: In this phase, investigator introduced herself with the student and explained her purpose of taking the class. Foremost, Intelligent test was given to the whole class. The students who secured between 45 and 60 in intelligent test and scored a poor mark that is below 15 out of 25 in their class test were selected for the study. Based on this criterion, only 10 students were selected from each school. These students were given the next test that is `First Questionnaire for Mathematical Disabled children', this test was considered as the pre-test by the investigator. The obtained marks of each student were jot down by the investigator and on random basis the students were divided into two groups, (five in experimental and five in controls).

Second phase: This phase was regarded as practice session phase, where the experimental group was given the treatment while control group was kept aside. Along with formal technique that is text-book, the investigator used in-formal techniques such as coins, pebbles, black-board and mainly computer for teaching the students, through which teaching-learning process becomes more effective. The experimental group received regular classroom treatment along with special treatment but the control group only received classroom treatment. The practice session for the experimental group continued for three weeks, it was given during the zero hour.

Third phase: In the final phase of the study, the investigator gave the next questionnaire to both the groups (experimental and control). The `Second Questionnaire for Mathematical Disabled children', this test was considered as the post-test. The score obtained by the students of both the groups were jot down by the investigator.

After the complete of the three phases, the investigator analysed the data (obtained scores of both the tests) for its finding..

ANALYSIS AND RESULT:

In this study the data are obtained scores from the test (pre-test and post-test) by the two groups (experimental and control).

Table 1: School-wise selection of students from urban and rural area

Area	Number of school	Total number of students in a class	Number of rejected students	Selected students in group		Number of selected students
				Experimental	Control	
urban	1	30	20	5	5	10
	2	33	23	5	5	10
rural	1	25	15	5	5	10
	2	31	21	5	5	10
	TOTAL			20	20	40

Table 1: This table depicts the number of selected schools from both the areas (urban and rural). Only one-third school from each area were selected for the study. From each area two schools were included, where ten mathematical disabled students were been selected from per schools. Overall forty students who were having mathematical disability were included in the study.

Table 2: Area and group wise: comparison of mean score

Area	No. of school	Group	Test	Mean
URBAN	A	Experimental	Pre-test	25.6
			Post-test	56.8
		Control	Pre-test	35.6
			Post-test	29.6
	B	Experimental	Pre-test	33.6
			Post-test	58.4
		Control	Pre-test	37.6
			Post-test	35.2
RURAL	A	Experimental	Pre-test	30.4
			Post-test	54.4
		Control	Pre-test	38.4
			Post-test	37.6
	B	Experimental	Pre-test	30
			Post-test	51.6
		Control	Pre-test	32.8
			Post-test	31.2

Table 2: The table shows the highest and lowest mean score of the experimental groups in post-test, 56.8 was highest mean secured by school (B) of urban area and 51.6 was lowest mean secured by school (B) of rural area. The mean difference between the two areas is 5.2.

Table 3: - Group wise-comparison of t value

Group	Test	No. of student	Mean	SD	t value	significance
Experimental	Pre-test	20	29.9	7.82	9.73	0.01
	Post-test		55.2	12.6		
Control	Pre-test	20	36.1	8.9	2.8	_
	Post-test		33.4	6.52		

Table 3: The table shows that there is significant difference in the scores of the two groups of mathematical disabled students and the t-value is 9.73 which are highly significant at 0.01 levels.

FINDING:1.

1.Mean score shows negligible difference between urban and rural area children when instruction was imparted through computer assisted technique to mathematical disabled students.

2. t value shows positive effect of computer assisted instruction on students having mathematical disability. The instruction helps the students in understanding the symbols.

DISCUSSION:

The findings showed that computer instruction is an effective process for mathematical disabled children in a town (including urban and rural area). Positive outcomes were been reported by various experts for employing special strategy (that is computer). Computer is a useful technique which helps in teaching the mathematical disabled children. Cosden and Semmel (1987) study found that computer are mostly used with the `drill-and-practice software packages' in mathematics while especially on teaching `elementary school level' students. Maddux (1984) study viewed that `LOGO is particularly' suitable for learning disabled children. Lewis (1998); Raskind and Higgins (1998) studies found that computer with `mathematical software program' individualizes, `provide feedbacks and offer repetition' which helps the students to get motivated. Ragosta, Holland and Jamison (1981); Lavin and Sandars (1983); Niemiec and Walberg (1987) studies showed that the use of computer assisted instruction have influence in mathematics of primary grade children, `especially when used as additional practice'.

Thus, the experimental group participants (both from urban and rural area) who received practice session with computer were able to recognize and use mathematical symbols in proper way.

Finally, on the basis of the finding the investigator can suggest that special strategy (computer assisted instruction) should be used with children who are having mathematical disability. This will help the children to understand the numerical symbols more properly and thoroughly. Even it will help in decreasing of drop-out to a certain extent in upper primary level and help them to progress in academic area. Even the result showed that area does not matter if the instruction is imparted in proper way.

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