FUNCTIONAL MATHEMATICS: PROBLEMS AND INTERVENTION OF DYSCALCULIC ELEMENTARY SCHOOL STUDENTS

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Abstract: This article examines the problems faced by dyscalculic elementary school students in the functional mathematics. Numeration, computation, fractions, measurement and functional mathematics could be taken as basic mathematical difficulty areas for dyscalculic students. Here in this paper only one dimension was taken and that is functional mathematics. Data were collected through questionnaires developed from a set of subjective well-being measures and interviews of parents and teachers. Based on the performance of dyscalculic student's in the intervention program following results were obtained: (i). There is a significant impact of the Intervention Program on the mathematical performance of dyscalculic VIIIth grade students on mathematical disability: Functional mathematics. (ii). The trend in the means for Pre-test (9.66) and for the Post-test (14.66) shows that intervention program improved the performance of VIIIth grade student in Post-test as compared to Pre-test scores on functional mathematics dimension. Therefore, this study conclude that Intervention was successful for functional mathematics, but dycalculic VIIIth grade students understood time and time conversions easily than money problems. Every time when investigator used the multi-media or digital intervention for clarification of any concept the students understood the concept efficiently. The results also encouraged the fact that the mathematics teacher can play an important role in the development of dyscalculic student's awareness.

Keywords: Dyscalculia, low numeracy, elementary school students, functional mathematics

1. Introduction

Dyscalculia and low numeracy were distinct deficits and caused by deficits in non-symbolic and symbolic processing, respectively. Moreover, these deficits appeared to be persistent and could not be remedied simply through day-to-day school mathematical learning (Tang, 2013). "Henschen, a Swedish neurologist who found that it was possible for a person to have impaired mathematical abilities that did not affect intelligence in general in 1919. It is also referred to as developmental arithmetic disorder and "number blindness". Thus the concept of dyscalculia came in to existence" (Nagavalli, 2015). The very first study on dyscalculia was conducted by Landislav Kosc in Bratislava, 1974. He found Dyscalculia as a structural disorder of mathematical abilities. Later many researches and studies were conducted on dyscalculia and based on these results symptoms and types of dyscalculia, problem faced by the children in learning arithmetic were figured out.

According to Halberda (2008) to learn arithmetic in the normal way is an endogenous core deficit in the sense of number. This has been associated with low numeracy in general and related this deficit in the number sense with dyscalculia more specifically says

Landerl,(2004).

Dyscalculic children may have problem with

- Making sense of numbers
- Remembering numbers and formulae
- Estimating numbers (e.g. predicting outcomes).
- Estimating distance and time
- Understanding number concepts

• Estimating time (e.g. how long an assignment will take)
• Number relationships (e.g. relationship between decimals, percentages and fractions)

Use of multi-sensory resources (e.g. mnemonics, gestures, practical activities etc.), explaining the concepts and ground in real world, if possible (e.g. cut a paper in half and then a quarter to demonstrate fractions), moving from concrete to abstract concepts using manipulative (e.g. concrete-semi-concrete- abstract), allowing student to explore ideas and concepts and utilizing over learning to ensure concepts are recalled, would be very helpful to overcome the problems faced by dyscalculic children.

DYSCALCULIA AND FUNCTIONAL MATHEMATICS:

Dyscalculic students find very difficult in telling Time to Hour (half hour, quarter hour, nearest hour, nearest half hour, nearest quarter hour) and minutes, time difference (minutes, five minutes, 15 minutes,…), seasons and months names, conversions (seconds to minutes, minutes to hour, days to months, months to weeks, weeks to days, days to hours,…). Functional math skills are those skills that students need to live independently in the community, care for themselves, and make choices about their lives. Functional skills make it possible for students with disabilities to make choices about where they will live, how they will make money, what they will do with money, and what they will do with their spare time. To do these things, they need to be able to count money, tell time, read a bus schedule, follow directions at work, and know-how to check and balance a bank account (Webster, 2019). One-to-one correspondence will be helpful in household tasks such as setting the table and matching socks. Other functional skills include: Number recognition (recognizing and being able to write the 10 digits, and recognizing place value: ones, tens, and hundreds), Skip counting (skip counting by 5's and 10's to 100 is important for understanding time: such as five-minute increments on an analog clock) and money and Operations (addition and subtraction). If students have an understanding of these two operations, it will be easy to introduce multiplication and division.

Time

Time as a functional skill involves both understanding the importance of time— such as telling time on analog and digital clocks to get to school, work, or even the bus on time. Understanding of time requires comprehending the fact that seconds are fast, minutes almost as fast, and hours much longer. Students with disabilities, especially having cognitive or developmental disabilities, may have behavioral outbursts because they are "stuck" on preferred activities, and they don't even realize that they will miss lunch. Building an understanding of time in them, may involve a visual clock, like a Time Timer, or a picture schedule.

Money

Money, as a functional math skill, has several levels of skills (a) Recognizing money: mixed coins and rupees. (b) Counting money: first in single denominations and later mixed coins and (c) Understanding the value of money: budgets, wages, and paying bills. We use math in our daily lives all the time such as shopping (shop for groceries, save for a big purchase), getting to places at a certain time (catch the bus to get to work), following a recipe and paying bills, all require basic math skills. Students with learning difficulties learn these skills by watching others. They often need more specific instructions to acquire functional math skills. Goals that address functional math skills are usually included in students' Individual Education Plans (IEPs). Special education teachers often include functional math skills in their curriculum for students with disabilities. Dyscalculic student need to understand the concept of time and money on prior bases. Having a general idea of how long five minutes is versus five hours will help dyscalculic students understand daily schedules and routines. Realizing that seconds pass quickly and hours take longer will help students to know what to expect when they have to wait for something. As dyscalculic student need to understand the concept of time, similarly they also have the need to comprehend the use of money in their daily lives.

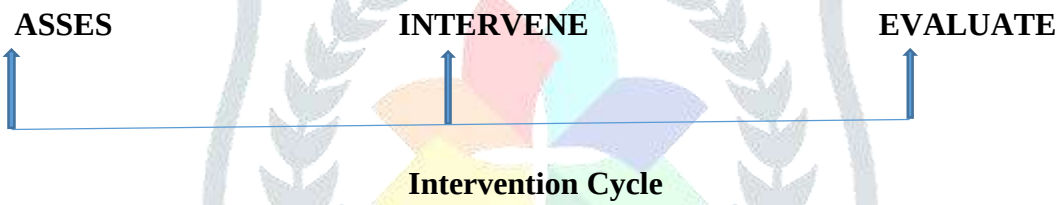
INTERVENTION

Kumar (2003) while studying the effectiveness of certain instructional strategies to overcome learning disabilities in arithmetic among secondary school children, found significant difference in the post-test performance of learners than pre-test by using various instructional strategies. Shih (2006) studied the effects of number sense intervention on second-grade students with mathematics learning disabilities, the results showed that students who received repeated practice followed by number sense instruction had better initial performance on fact retrieval and could generalize what they learned to more novel tasks such as solving word problems. Michaelson (2007) in a study regarding methods for ascertaining and accommodating dyscalculic children in the classroom suggested that certain practical methods and instructional designs can be implemented in the classroom to address the specific learning needs of dyscalculic learners. Gowramma, et al. (2010) studied "A Remedial Intervention for Addition and Subtraction in Children with Dyscalculia". Data analysis indicated a significant increase in the subtraction and addition performance after remedial intervention. Therefore, in this study investigator had identified VIIIth grade students from District Shimla Himachal Pradesh by random sampling and after that using cluster sampling investigator performed intervention program on 12 severe cases of dyscalculia. Intervention program for 4 months duration was done. In this study remedial intervention for functional mathematics in VIIIth Grade Dyscalculic Students was done.

Intervention for students with Dyscalculia

Henderson, et al. (2003) proposed a model of intervention for the students with dyscalculia as below:

Figure 1



Intervention Cycle

The above intervention cycle reveals that, the students have to be assessed about the problem, then the intervention should be given for the mathematics learning disability, then the effect of intervention should be evaluated.

In view of **Wilson (2010),** the best approach to remediating dyscalculia would be:

(a) To identify the areas where the child has a difficulty, and

(b) To try and target an intervention at these areas.

Objectives

To study the impact of the Intervention Program on the mathematical performance of Dyscalculic VIIIth grade students on Functional Mathematics.

Hypothesis

There will be no significant impact of the Intervention Program on the mathematical performance of Dyscalculic VIIIth grade students on Functional Mathematics.

Methodology

Sample

For the present investigation 'Random Sampling' and 'Cluster Sampling' was done. From all the 12 districts of Himachal Pradesh, one district Shimla was selected at random. Out of 27 rural and 35 urban schools

12 children were selected (students scoring with 25th percentile or below) by cluster sampling technique to be included in the sample.

Design of the Study

The research design selected for the present study was Factorial Research Design" to assess the effectiveness of Intervention program on dyscalculia among School students in selected school.

The layout of the design is given as under in Table- 1

Table-1
Design of the Study

Randomly Selected Dyscalculic Students	Pre-test	Intervention Program Treatment	Post-test
Experimental Group	O1	X	O2

'Descriptive Survey Method', a detailed description of existing phenomenon is collected with the intent of employing data to justify current conditions and practices or to make intelligent plans and recommendations for further improvement. To study the differences of scores of dyscalculic VIIIth grade students in Pretest and Post-test, t-test was employed. Further, percentages was computed for studying the differences on mathematical difficulties, types of dyscalculia and dimensions (numeration, computation, fractions, measurements and functional mathematics) in Pre-test and Post-test.

ANALYSIS AND INTERPRETATION

MEAN SCORES AND STANDARD DEVIATIONS ON FUNCTIONAL MATHEMATICS DIMENSIONS OF DYSCALCULIA ON DYSCALCULIC VIIIth GRADE STUDENTS

In order to study the differences on functional mathematics dimension of dyscalculia, the mean scores and standard deviations were computed which are given in Table 2

Table-2

Mean Scores and Standard Deviations and t-values on Functional Mathematics Dimension

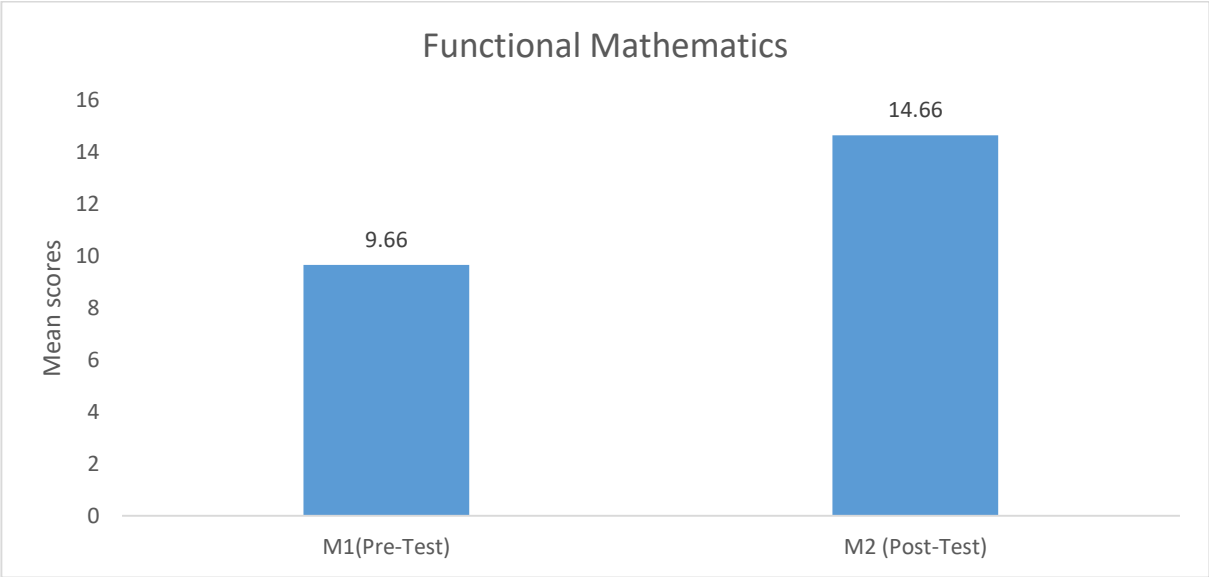
Dimensions	Test				t-value
	Pre-test		Post-test		
Functional mathematics	M_1	9.66	M_2	14.66	2.297
	σ_1	4.85	σ_2	5.77	

*significant at 0.01 level of significance for df 11 (Table value = 2.718)

It is clear from Table-2 that the t-value for comparing the impact of the Intervention Program on the mathematical performance (pre-test and post-test) of dyscalculic VIIIth grade students on functional mathematics dimensions has come out to be 2.297. The value is not significant at 0.01 level of significance for 11 df. Therefore, the hypothesis stated as," There will be no significant impact of the Intervention Program on the mathematical performance of dyscalculic VIIIth grade students in the following areas of mathematical disability: Functional mathematics", was accepted. From this, it can be said that there is no significant difference between the scores of Pre-test and Post-test on dyscalculic VIIIth grade students with regard to functional mathematics dimension. Figure-2 shows the comparison of the mean scores of dyscalculic VIIIth grade students on functional mathematics dimension as below:

Figure- 2

The Mean Scores of VIIIth Grade Dyscalculic Students on Functional Mathematics



From Table-1 and Figure-2, it can be seen that the mean for Pre-test for VIIIth grade students is equal to 9.66 and that for post-test for VIIIth grade students is equal to 14.66. In other words, the intervention program improved the performance of VIIIth grade student in Post-test as compared to Pre-test scores.

RESULTS

1. There is no significant difference between the scores of Pre-test and Post-test on dyscalculic VIIIth grade students with regard to functional mathematics dimension.
2. There is a significant impact of the Intervention Program on the mathematical performance of dyscalculic VIIIth grade students on mathematical disability: Functional mathematics.
3. The trend in the means for Pre-test (9.66) and for the Post-test (14.66) shows that intervention program improved the performance of VIIIth grade student in Post-test as compared to Pre-test scores on functional mathematics dimension.

CONCLUSIONS

Intervention was successful for functional mathematics, but dycalculic VIIIth grade students understood time and time conversions easily than money problems. Every time when investigator used the multi-media or digital intervention for clarification of any concept the students understood the concept efficiently. The results also encouraged the fact that the mathematics teacher can play an important role in the development of dyscalculic student's awareness.

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