



An Effect Of Mathematical Intervention Strategies For Dyscalculia Students

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Abstract

Mathematical efficiencies are basic for the children to grow and live independently in a numerate society, which has a progressive effect on academic performance. Dyscalculia is a term used for difficulties in learning mathematics. These difficulties include poor memorization of math facts, poor calculation skills, as well as poor math problem solving and math reasoning skills (APA, 2018). There are certain areas of difficulty in learning mathematics for the dyscalculia learner. In these areas, they cannot attempt in time due to the low basic mathematics fluency and reasoning. Teaching in such difficult areas of mathematics, the dyscalculia students should be provided with specialized instructions and dedicated time. Hence for the present study 40 students were given treatment in overcoming their anxiety towards mathematics, to develop positive attitude towards mathematics which will enhance their academic score in mathematics. In this present study Pre-experiments are the simplest form of research design is applied. A single case (Dyscalculia students) is observed at two time points, one before the treatment and one after the treatment. Results revealed that the Mathematical Intervention strategies had a positive and significant effect on dyscalculia students. Effective ways to deliver the Mathematics was discussed.

INTRODUCTION

Education determines the level of prosperity, welfare and security of the population. Through education children become responsible, accountable with knowledge and behaving as good citizen of strong and powerful persons. Some students found to be anxiety towards mathematics, very low attitude in learning Mathematics due to this their academic performance in Mathematics seems to be very low. They differ from their talent of doing mathematical operations from their peer group. Students who are facing difficulties in learning mathematics, identifying the symbols, numbers and difficult to do calculations considered as students with dyscalculia.

Kosc was the first to highlight the developmental nature of the disorder and define dyscalculia as an innate disorder with genetic base that exists without a simultaneous disorder of general mental functions (Kosc, 1974). Dyscalculia is a term used for difficulties learning mathematics. These difficulties include poor memorization of math facts, poor calculation skills, as well as poor math problem solving and math reasoning skills (APA, 2018).

School children with mathematical learning difficulties have problems in solving basic mathematical problems. They find it difficult to remember and retain basic mathematical facts and have trouble in figuring out their knowledge and skills to solve mathematical problems. If basic mathematical skills are not mastered, learners may have difficulty in doing advanced mathematical applications. Dyscalculia is seen to be a developmental

as well as acquired learning disability and the effects of the disorder can be controlled with appropriate support, guidance and interventions at home and school.

THEORETICAL BACKGROUND

Dyscalculia refers to a range of math learning disabilities. Students with dyscalculia have difficulties in understanding what numbers mean, remembering math facts, and steps to complete math problems or may have difficulty with visual-spatial concepts used in making patterns or in geometry. Dyscalculia may be related to language processing disorders which result in difficulties learning math vocabulary needed to understand math concepts and to solve more complex problems. Children with dyscalculia typically have a greater degree of math anxiety. For instance, Kucian et al. (2018) reported that students with dyscalculia had higher math anxiety and poorer performance in comparison with other children. Mathematics anxiety is a cause of dyscalculia, but it surely poses some problems for students with dyscalculia and affects their learning process by exacerbating the existing condition (Butterworth, 2005b).

Children with dyscalculia often lag behind their peers in academic performance, and perform tasks inaccurately and slower than typically developing children (Monei & Pedro, 2017). It is essential to work with dyscalculic children both at home and at school to develop a positive attitude towards learning mathematics and provide additional support for learning mathematics effectively. Thus, the parents, as well as the teacher, should support the dyscalculic children to motivate them and overcome the particular difficult area of mathematics.

A researcher might suspect that he/she has a dyscalculia pupil in his/her class who is otherwise a competent student has difficulty with ordinary numeric operations and relies on finger-counting for all four arithmetic operations, while his peers have progressed to more efficient strategies. The researcher want to help the child. The current study may come out with effective Mathematical intervention strategies to tackle the problems faced by the dyscalculia learners of sixth standard students.

REVIEW OF RELATED LITERATURE

The study examined by Purwaningrum et al., (2021), examined the effectiveness and the positive responses given by dyscalculia students and teachers toward a module oriented to Kudus' local wisdom to improve the mathematical creative thinking ability of dyscalculia students. This research was conducted in Kudus Regency, Central Java, Indonesia with 75 fourth graders from eight different elementary schools as the subject of the study. The model used in the teaching materials development is the Dick and Carey model. The results showed that the local wisdom-oriented module which was developed according to the experts is excellent. In addition, the results of the Pre-test and Post-test showed that there is an increase in the mathematical creative thinking ability of dyscalculia students. Meanwhile, the results of interviews and questionnaires showed that teachers and dyscalculia students give positive responses to the use of modules oriented to Kudus' local wisdom.

Nagavalli (2015) studied the relevancy of innovative methods of primary school children with dyscalculia in Salem district. Assessment as remedial strategy was employed on the children with dyscalculia. Present research aimed to achieve "mathematics learning difficulties and targeted the remedial measures suitable for primary school children". The research showed that mathematical skills are improved by using manipulates and helped to reduce the problems faced by students. Many strategies (Graphic Organizers and RIDGES) are included in present research. For skills of addition and subtraction, dot numeracy and derived fact strategy were found more effective than others.

SYMPTOMS OF DYSCALCULIA IN HIGH SCHOOL STUDENTS

As already discussed above, dyscalculia students often struggle with number and number concepts that can lead to a diverse range of difficulties related to numbers in mathematics. Dyscalculia children have difficulties related to recognizing and remembering numbers, counting, associate number symbol with the number value, identifying patterns and placing things in the right order. Some common areas of difficulty in mathematics for dyscalculia students are stated below in brief:

- **Counting backward and counting in steps:** Counting backward and stepwise.
- **Sequencing and recognizing patterns:** Troubles with recognizing patterns and sequencing numbers.
- **Calculations:** Choosing the correct numerical operation and applying it correctly.

- **Direction/orientation:** Difficulty immediately sorting out direction, spatial orientation, confusion over left, right, high, low and depth.
- **Estimation:** Understanding place value, problem-related to estimating quantities from the given numbers or numeric values, mathematical concepts, rules and formulae.
- **Time:** Problem-related to tell the time on an analogy clock.
- **Assessing numerical quantity:** Identify the number numerically larger or smaller.
- **Money:** Making sense of money and estimating quantities.
- **Mental mathematics:** Difficulty remembering procedures in mathematics recognize quantities without counting, recalling basic math facts, linking numbers and symbols and problem-solving.
- **Fraction:** Poor visual and spatial orientation in fraction diagram.

NEED AND IMPORTANCE OF THE STUDY

Mathematical efficiencies are basic for the children to grow and live independently in a numerate society, which has a progressive effect on academic performance, which will further enhance their job opportunities with finance. Numeracy means the ability to apply mathematical concepts in various aspects of daily in life. Its skills involve perceptive of numbers, measuring, resolving number problems, sorting out, counting correctly, watching of patterns, adding and subtracting, fractions etc. Students have to be well aware of the numbers, basic operations, symbols and mathematical terms while solving the problems. That is the importance of the mathematical learning process.

Dyscalculia is a specific learning disorder that influences the arithmetical abilities of children. Generally, dyscalculia children struggle to memorize number facts, understanding the logical steps needed to solve the mathematical problem. They also have difficulties in numerical calculations related to daily life. Thus, the arithmetical deficits not only impact their achievement but also on other related fields beyond the class. Generally, mathematics is considered a difficult subject due to its abstract nature to all learners. Then the dyscalculia student should face more difficulty due to their weak number sense and poor reasoning towards mathematics. There are certain areas of difficulty in learning mathematics for the dyscalculia learner. In these areas, they cannot attempt in time due to the low basic mathematics fluency and reasoning. Teaching in such difficult areas of mathematics, the dyscalculia students should be provided with specialized instructions and dedicated time. Similarly, they should be cared for and well treated at school through providing classroom outside and inside learning environment. Likewise, the parents should also provide sufficient time at their home for doing homework, playing, or doing something. Very few researches have been done in the area of mathematical disorder compared to other learning disorders. Few studies have focused on the various types of dyscalculia; dyscalculia at various levels of education; relationship of dyscalculia with other learning disabilities; comparison of dyscalculia and normal children; and strategies to overcome dyscalculia. Thus, in the present study the efficiency of the dyscalculia students can be uplifted through utilizing effective Mathematical intervention strategies.

METHODOLOGY

Quantitative Research has been conducted among the high school students who are studying in the sixth standard students. Diagnostic test has been given among three sections of students in sixth standard totally nearly about 120 students were subjected to take the test. From these 120 students 30 students were identified that they have anxiety towards mathematics and finding difficult in solving the mathematical problems i.e., they are seeming to be students suffering from Dyscalculia. In this present study Pre-experiments are the simplest form of research design is applied. In a pre-experiment either a single group or multiple groups are observed subsequent to some agent or treatment presumed to cause change. A single case (Dyscalculia students) is observed at two time points, one before the treatment and one after the treatment. Changes in the outcome of interest are presumed to be the result of the intervention or treatment. No control or comparison group is employed. This treatment is given for 30 dyscalculia students. For the anxiety towards the mathematics and attitude towards mathematics survey questions were give before and after treatment. There Academic score in the mathematics is also measured by giving them pre-test and post-test. The treatment was given for nearly 30 hours, one hour for each day which constitute 30 days of treatment. In which basic mathematics has been thought through using special instructional aids and worksheets were given for the students.

RESEARCH QUESTIONS

1. Is there is any significant difference between pre-attitude and post-attitude of students with dyscalculia towards learning Mathematics?
2. Is there is any significant difference among the students with dyscalculia before and after the treatment in Mathematics anxiety?
3. Is there is any significant difference between pre-test and post-test of students with dyscalculia?

FINDINGS FOR THE RESEARCH QUESTIONS

Question 1: Is there is any significant difference between pre-attitude and post-attitude of students with dyscalculia towards learning Mathematics?

Table 1:-Mean difference between pre-attitude and post-attitude of students with dyscalculia towards learning Mathematics

Variable	N	Mean	Standard Deviation	t value	P value
Pre-Attitude	30	17.43	4.541	8.321	P<0.001**
Post-Attitude	30	20.34	3.142		

** Significant at 0.01 level

It is observed from the above table that Attitude of students with dyscalculia towards learning mathematics was found to be better in post attitude (20.34) than the pre-attitude (17.43). Hence, the attitude towards mathematics students is positively significant at 1% level. It is evident that high school students attitude towards mathematics have shown improvement after the class taken for mathematics students with dyscalculia. Therefore, the remedial measures showed improvement in changing the attitude of the high school students towards mathematics in a positive manner.

Question 2: Is there is any significant difference among the students with dyscalculia before and after the treatment in Mathematics anxiety?

Table 2:-Mean difference among the students with dyscalculia before and after the treatment in Mathematics anxiety

	N	Mean	Standard Deviation	t value	P value
Before Treatment	30	23.24	3.587	16.458	P<0.001**
After Treatment	30	38.12	7.567		

** Significant at 0.01 level

It is observed from the above table that Mathematics anxiety of students with dyscalculia was found to be better after treatment (38.12) than the before treatment (23.34). Hence, the Mathematics anxiety of students is positively significant at 1% level. It is evident that high school students Mathematics anxiety have shown improvement after treatment for the students with dyscalculia. Therefore, the treatment has showed improvement in changing the Mathematics Anxiety of the high school students and hence, high school students were able to overcome their anxiety and learnt mathematics in a progressive way.

Question 3: Is there is any significant difference between pre-test and post-test of students with dyscalculia?

Table 3:-Mean difference between pre-test and post-test of students with dyscalculia in Achievement Scores in Mathematics

Test	N	Mean	Standard Deviation	t value	P value
Pre-Test	30	19.25	7.965	15.237	P<0.001**
Post-Test	30	35.89	5.268		

** Significant at 0.01 level

It is observed from the above table that Achievement scores in Mathematics of students with dyscalculia was found to be better in post-test (35.89) than the pre-test (19.25). Hence, the Achievement in Mathematics

students is positively significant at 1% level. It is evident that high school students Achievement in mathematics have shown improvement after the treatment given for mathematics students with dyscalculia. Therefore, class taken for the remedial measures showed improvement in changing the Achievement score in Mathematics in an effective manner.

CONCLUSION

Mathematical intervention strategies had an effective change among the dyscalculia students, where their anxiety towards mathematics has been overcome and positive attitude of learning mathematics had improved and at last their Achievement score in Mathematics is good. Which had developed confidence to the sixth standard students to learn Mathematics. The present research indicates that motivating children by acknowledging and praising them, as well as using techniques that help them to overcome their math anxieties are proven to be effective in supporting those students. In conclusion, despite the view that dyscalculia is a persistent disability, adequate support, and early identification could reduce its consequences for a child (Sousa et al., 2017). If not assisted on time, dyscalculia may hamper children's educational perspectives and bring problems with employability in adulthood (Soares et al., 2018). Although dyscalculia is not the result of inappropriate instruction and teaching methods, having adequate knowledge and applying it, will positively influence the process and lead to a more successful intervention. Hence the vital role has to play by both mathematics teacher and parents to bring out the desirable change in their educational learning process.

EFFECTIVE WAYS TO DELIVER THE MATHEMATICS

- ✓ Provide sufficient time for solving mathematical problems
- ✓ Make learning fun by teaching using gamming methods to teach mathematics
- ✓ Make learning multi-sensory
- ✓ Use collaborative learning
- ✓ Make it real
- ✓ Use modern technology to solve Mathematical problems
- ✓ Rapport building between the Mathematics teacher and the students.

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