

A CASE STUDY OF STUDENTS WITH DYSCALCULIA AND THEIR MATHEMATICAL ABILITIES OF CALCULATION AT A PRIMARY SCHOOL IN ITANAGAR

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Abstract

This case study explores the challenges faced by primary school students with dyscalculia in their ability to perform mathematical calculations at a school in Itanagar, India. Dyscalculia, a specific learning disability that affects numerical processing and calculation, often hinders academic progress and can lead to long-term difficulties in mathematical comprehension. The study focuses on a group of students diagnosed with dyscalculia, examining their mathematical abilities, learning experiences, and the instructional strategies employed by teachers to support them. Through qualitative methods, including classroom observations, interviews with teachers, and diagnostic assessments of students, the research identifies patterns in calculation errors, cognitive processing gaps, and the impact of personalized interventions on student outcomes. Additionally, the study investigates the role of the school environment, resources, and teacher training in facilitating or hindering the learning process for children with dyscalculia. The findings provide insight into the unique educational needs of students with dyscalculia and offer recommendations for creating more inclusive and supportive learning environments in primary schools, particularly in regions with limited access to specialized resources like Itanagar. This research highlights the importance of early identification, tailored teaching approaches, and ongoing support to improve mathematical learning outcomes for students with dyscalculia.

Introduction

Dyscalculia is a specific learning disability that primarily affects an individual's ability to understand and work with numbers. Characterized by difficulties in arithmetic, number sense, and mathematical reasoning, it is often compared to dyslexia but remains less recognized and addressed in educational systems. Students with dyscalculia typically struggle with fundamental mathematical concepts, such as simple mathematical operations, number comparisons, and understanding numerical sequences, which can severely impact their academic performance and self-esteem (Butterworth, 2019). Early identification and intervention are crucial for helping these students, but in many regions, including

rural and developing areas, there is limited awareness and fewer resources available to diagnose and support children with dyscalculia (Shalev & Gross-Tsur, 2020).

Learning disabilities such as dyscalculia are often under-researched and underreported, especially in less urbanized regions. This is particularly evident in the Northeastern state of Arunachal Pradesh, where access to specialized resources, including diagnostic tools and trained professionals, is often limited. Itanagar, the capital of Arunachal Pradesh, provides a unique setting for examining the educational challenges faced by students with learning disabilities, given the region's geographical isolation and resource constraints.

This case study investigates the ability of students diagnosed with dyscalculia in a primary school in Itanagar to perform mathematical calculations. The research aims to explore the specific difficulties these students encounter, the strategies employed by teachers to address these challenges, and the overall support systems in place for inclusive education. Understanding these factors is essential for developing targeted interventions and improving learning outcomes for children with dyscalculia in regions with limited access to specialized educational resources (Kumar & Patnaik, 2021).

This case study in Itanagar, the research contributes to the growing body of knowledge on dyscalculia and highlights the need for improved awareness, training, and resources in India's education system.

Specific Learning Disability

A learning disability is a neurological disorder that affects an individual's ability to acquire, process, or express information. It can impact skills such as reading, writing, mathematics, or communication, despite normal intelligence and sensory abilities. Common learning disabilities include dyslexia (difficulty with reading), dyscalculia (difficulty with math), and dysgraphia (difficulty with writing). These conditions often manifest during school years and can significantly affect academic performance and everyday life. Early identification and tailored educational interventions are essential for helping individuals with learning disabilities reach their full potential (American Psychiatric Association, 2013).

Learning disabilities are characterized by specific challenges in processing information, despite average or above-average intelligence. Individuals with learning disabilities may struggle with skills

such as reading (dyslexia), writing (dysgraphia), or math (dyscalculia). These difficulties often manifest as slow reading, poor handwriting, trouble with basic calculations, or difficulty following instructions. Common characteristics include difficulty organizing thoughts, trouble remembering new information, and inconsistent performance in school. Learning disabilities are lifelong and vary in severity, but with proper support and intervention, individuals can develop strategies to overcome these challenges and succeed academically and socially (Lerner & Johns, 2012).

Types of Specific Learning Disability

- 1. Dyslexia:** Difficulty with reading, including challenges in decoding words, reading fluency, and comprehension. It affects the ability to recognize and process written language.
- 2. Dyscalculia:** Difficulty with mathematical concepts, such as understanding numbers, performing calculations, and grasping arithmetic operations.
- 3. Dysgraphia:** Difficulty with writing, including issues with handwriting, spelling, and organizing thoughts on paper.
- 4. Auditory Processing Disorder:** Difficulty in processing sounds and distinguishing between similar sounds, despite normal hearing, which can affect language comprehension.
- 5. Visual Processing Disorder:** Difficulty in interpreting visual information, such as recognizing shapes, spatial awareness, or distinguishing visual patterns.
- 6. Nonverbal Learning Disabilities:** Challenges in understanding nonverbal cues like body language or facial expressions, often accompanied by strong verbal skills but poor motor coordination and spatial skills.

These learning disabilities affect academic performance and may require individualized support and intervention to help students succeed.

Dyscalculia: It is a specific learning disability that affects an individual's ability to understand and perform mathematical tasks. It involves persistent difficulty with basic arithmetic skills such as number sense, calculations, and understanding numerical concepts, despite adequate intelligence and

education. Individuals with dyscalculia may struggle with tasks like counting, recognizing numbers, telling time, or solving simple math problems.

The condition is neurological in nature, often affecting memory, spatial reasoning, and cognitive processing related to numbers. Dyscalculia can hinder daily activities involving math, such as managing money, measuring, or following directions. Early identification and targeted interventions are crucial for supporting individuals with dyscalculia in academic and real-world settings.

Definition of Dyscalculia

Dyscalculia is defined as a specific learning disability that impairs an individual's ability to understand, learn, and perform mathematical calculations, despite normal intelligence and appropriate educational exposure (**Geary, 2013**). This condition primarily affects number sense, memory of arithmetic facts, and the ability to perform simple calculations.

Characteristics of Dyscalculia

- ❖ Struggles with basic number sense, such as recognizing the value of numbers or counting accurately.
- ❖ Difficulty performing basic calculations, such as addition, subtraction, multiplication, and division.
- ❖ Trouble recalling basic math facts, like times tables or number sequences, even after repeated practice.
- ❖ Struggles with telling time, understanding time-related concepts, or following sequences of directions.
- ❖ Difficulty understanding mathematical symbols, such as $+$, $-$, \times , \div , and their application in calculations.
- ❖ Inability to estimate quantities or distances accurately.
- ❖ Problems with understanding spatial relationships, such as difficulty recognizing patterns or understanding geometry.
- ❖ Increased anxiety or frustration when dealing with numbers or mathematical tasks, which can further hinder learning.

Statement of the Problem

A Case Study of Students with Dyscalculia and their Mathematical Ability of Calculation at a Primary School in Itanagar

Objectives of the study

1. To find out prevalence of students with dyscalculia in primary school.
2. To find out significant difference in mathematical abilities of calculation between male and female students with dyscalculia in primary school.

Hypothesis of the study

1. There is a significant proportion of students in the primary school who exhibit characteristics of dyscalculia, as determined by diagnostic assessments.
2. There is a significant difference in mathematical abilities of calculation between male and female students with dyscalculia in primary school.

Method of the study

The researcher was used survey method for the study. The researcher had used Mean, Standard Deviation, t-Test and percentage for data analysis.

Population of the study

This case study has population of primary school students of Eklavya Public School, Itanagar

Sample Size of the study

Sample size for this case study has 60 students of primary education.

Tools of Research

In this case study the researcher had adopted DTLTD developed by Dr. Smirti Swarup and Dr. D. H. Mehta.

1. Test of Eye Hand Coordination
2. Test of Number Concept
3. Test Cognitive Functioning

Data Analysis

Table 1.1: Status of Mathematical Ability of students of Primary School

Themes	High	Medium	Low
Test of Eye Hand Coordination (EHC)	35%	40%	25%
Test of Number Concept (NC)	71%	-	29%
Test of Cognitive Functioning (CF)	56%	12%	32%

Table 1.2: Significant Difference in the Status of Mathematical Abilities of Calculation between Male and Female Students of Primary School the Area of Eye Hand Coordination.

Students	Strength	Mean	SD	T-Test
Female	24	8.41	1.52	0.43
Male	36	8.52	1.23	

The analysis explores the difference in mathematical calculation abilities between male and female primary school students in the area of EHC. The mean score for female students ($M = 8.41$, $SD = 1.52$) is slightly lower than the mean score for male students ($M = 8.52$, $SD = 1.23$). But on the other hand, the t-test value ($t = 0.43$) indicates that this difference is not statistically significant. This means that there is no significant difference between male and female students in their mathematical abilities related to eye hand coordination.

Table 1.3: Significant Difference in the Status of Mathematical Abilities of Calculation between Male and Female Students of Primary School the Area of Number Concept.

Students	Strength	Mean	SD	T-Test
Female	24	7.76	2.21	0.41
Male	36	7.69	2.20	

The analysis explores the difference in mathematical calculation abilities between male and female primary school students in the area of EHC. The mean score for female students ($M = 7.76$, $SD = 2.21$) is slightly higher than the mean score for male students ($M = 7.69$, $SD = 2.20$). But on the other hand, the t-test value ($t = 0.41$) indicates that this difference is not statistically significant. This means that there is no significant difference between male and female students in their mathematical abilities related to number concept.

Table 1.4: Significant Difference in the Status of Mathematical Abilities of Calculation between Male and Female Students of Primary School the Area of Cognitive Functioning.

Students	Strength	Mean	SD	T-Test
Female	24	8.21	1.48	0.40
Male	36	8.10	1.02	

The analysis explores the difference in mathematical calculation abilities between male and female primary school students in the area of EHC. The mean score for female students ($M = 8.21$, $SD = 1.48$) is slightly higher than the mean score for male students ($M = 8.10$, $SD = 1.02$). But on the other hand, the t-test value ($t = 0.40$) indicates that this difference is not statistically significant. This means that there is no significant difference between male and female students in their mathematical abilities related to cognitive functioning.

Discussion

Across the three areas EHC, NC, and CF gender comparisons reveal slight differences in mean scores between male and female students. However, none of these differences are statistically significant, as indicated by the t-test values in Tables 1.2, 1.3, and 1.4.

In the area of Eye Hand Coordination, the female students have a slightly lower mean score ($M = 8.41$, $SD = 1.52$) compared to male students ($M = 8.52$, $SD = 1.23$), but the t-test value ($t = 0.43$) confirms no significant difference between genders in this ability.

In the area of Number Concept, the female students show a slightly higher mean score ($M = 7.76$, $SD = 2.21$) than male students ($M = 7.69$, $SD = 2.20$). The t-test value ($t = 0.41$) indicates no statistically significant difference, meaning both genders perform similarly in number concept understanding.

In the area of Cognitive Functioning, the female students have a mean score of ($M = 8.21$, $SD = 1.48$) while male students have a slightly lower mean of ($M = 8.10$, $SD = 1.02$). Again, the t-test value ($t = 0.40$) shows no significant difference in cognitive functioning between genders.

Conclusion

The data analysis highlights that primary school students show a varied distribution of mathematical abilities, with a notable strength in number concepts and eye-hand coordination. But on the other hand, there is no significant difference in mathematical abilities between male and female students across all three tested areas (EHC, NC, CF). This suggests that both boys and girls in this primary school perform similarly in their mathematical skills, with gender not playing a significant role in their abilities. The results emphasize the need for further interventions to support students who fall in the low performance categories across these tests.

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