

Mathematics performance and challenges of the senior high school students with dyscalculia: an intervention program

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Abstract: Dyscalculia is a specific learning disability that affects a person's ability to understand mathematics. It is a difficulty in learning or comprehending arithmetic, such as understanding and manipulating numbers. Some schools refer to it as a mathematics learning disability; doctors sometimes call it a mathematics disorder. Mathematics disabilities can occur because of innate, genetic development origin. Senior High School students in Magsico National High School, Magsico, San Fernando, Cebu were the respondents of this study, identified having dyscalculia based on the Dyscalculia Screener Test results. Their Math Mental Test scores range from 4 to 25 out of the total test items of 32. The Achievement Test Performance of the students was very low with a range of 13-36 out of the total test items of 40. The achievement is below the expected 75%. The two examinations were correlated showing a low score in one exam, there is a lower likelihood of there being a relationship with the other exam. This means that a weak positive correlation would indicate that while both variables tend to go up in response to one another, the relationship is not very strong. This showed that the students have difficulty in Mathematics. Mathematics is viewed by students to be extremely difficult, particularly when it comes to problem-solving. Some students disliked Mathematics at the elementary level, but most of them have disliked it in high school. An intervention program was proposed for students with dyscalculia. There was school an at-home intervention program. Parents, teachers, school authorities, and students will be playing a vital role in this intervention program.

Keywords: Dyscalculia Screener Test, Intervention Program, Mathematics Achievement Test, Mathematics Mental Ability Test, Performance, Students with Dyscalculia

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INTRODUCTION

Math is necessary to everyday life as an adult, so difficulty learning basic math skills during childhood can lead to even greater problems in the future. In the past, more focus was placed on why children encountered issues learning to read and write rather than why they do poorly in math. However, the educational tide has recently turned, and more focus is being put on the various concerns students have in performing mathematical functions.

Learning disability is a weakness of a person wherein difficulty in learning certain or all subjects caused by some factors are genetically inherited. This particularly refers to a significant learning difficulty in an academic area. Such term does not include a learning problem that is primarily the result of the visual, hearing, or motor disabilities, mental retardation, emotional disturbance, or environmental, cultural, or economic disadvantage (Horowitz & Cortiella, 2014). According to the Learning Disabilities Association of America, learning disabilities is an "umbrella" term used to describe a set of more specific learning disorders, such as dyslexia, dysgraphia, and others characterized by inadequate development of learning basic skills such as reading, writing and/or math and even the higher-level skills such as organization, time planning,

abstract reasoning, long and short-term memory, and attention. The specific a learning disability that affects a person's ability to understand mathematics is referred to as dyscalculia.

Dyscalculia goes by many names. Some schools refer to it as a mathematics learning disability. Doctors sometimes call it a mathematics disorder. Kids and parents, on the other hand, may call it math dyslexia (the term math dyslexia can be misleading, though). Some people also say that it is a specific developmental disorder. Be it one term or another, they all mean the same thing, dyscalculia.

At no time in our history has the notion that Math disabilities, like other learning disorders, have the power to keep children from performing up to their potential in school and beyond been true. The disparity between those who learn Math with relative ease and those who struggle with math disabilities is widening at an alarming rate. Many Filipino students were not performing well in many mathematics competitions across different places.

The Philippines has been a participant since the Trends in International Mathematics and Science Study (TIMSS) started ranking countries' competitiveness in Math literacy in 1995. According to Chua, the Philippines lags the rest of the world in Mathematics expertise as shown by Filipino students' dismal scores in global tests like TIMSS (Yap, 2015). When TIMSS was first conducted in 1995 among 42 countries, the Philippines placed 30th in the mathematics test. In 1999, the Philippines ranked second the lowest out of 38 participating nations. In the 2003 Trends in International Mathematics and Science Study, the Philippines has paved its way to the bottom part of the rank. The country is in 41st place among 45 participating countries in the mathematics test. Filipino students are still weak in math and science, according to the results of the TIMSS as cited (Crisostomo, 2000). According to Quismundo, the results serve as a great challenge for every educator to take part in making learning meaningful to students to create change in their performance status (Lequin, 2014).

At Magsico National High School, there is a long-standing concern about low test scores, particularly in Math. This was shown most recently in the results of the National Achievement Test as well as school-based periodic tests during the school year. Also, based on the 2013-2014 results of the National Achievement Test (NAT), Filipino got an MPS of 76.34%, AP got 72.64%, English got 68.58%, Science got 43.48%, and Math obtained 64.54%. Magsico National High School ranked second in San Fernando Secondary School District, but Math results obtained low MPS among the five (5) subjects. These results revealed that the students did not understand well the basic math as they come up with the notion that Mathematics is very difficult to learn. Based on the Math teachers' records, some students showed dyscalculic tendencies.

It is in this premise that the researcher wants to find out if there are students who have difficulties in learning Mathematics caused by dyscalculia using the standard screener test, determine the performance in both Math achievement and mental ability tests, and identify the extent and direction of the relationship between these exams to come up with possible interventions that can best assist either for the improvement of the students' math performance or can decrease their learning disabilities in math. The results of the study would be the basis for designing an intervention program for students with dyscalculia.

Problem statement

This study assessed the mathematics performance and challenges of the Senior High School students with dyscalculia at Magsico National High School, Magsico, San Fernando, Cebu as the basis for a proposed intervention program.

Specifically, this study sought to answer the following questions:

1. What was the performance of the dyscalculic SHS students in the Mathematics examinations, particularly in Mathematics Achievement and Mathematics Mental Ability?
2. Is there a significant relationship between the Mathematics Achievement Test performance and the Mathematics Mental Ability Test performance of dyscalculic Senior High School students?
3. What were the challenges encountered by senior high school students with dyscalculia in learning mathematics?

METHODOLOGY

A descriptive correlational design was used to determine the performance (quantitative) supplemented with qualitative data about the challenges encountered by the Senior High School students with dyscalculia at Magsico National High School, Magsico, San Fernando, Cebu for the School Year 2021-2022. This study included the Senior High School students of Magsico National High School, Magsico, San Fernando, Cebu.

There were 330 senior high school students at Magsico National High School, Magsico, San Fernando, Cebu. Out of these 330 students, 69 not diagnosed but determined as dyscalculic students. There were 28 male and 41 female participants, a total of 69 students. These 69 students performed the Educational Psychological Screener Test, Mathematics Achievement Test, and Mathematics Mental Ability Test. Out of these 69 students, only 10 students with the lowest scores were interviewed about the challenges they encountered in learning math. Participants are school-aged around 18 old.

All of them were catered following the complete enumeration. The participation of these students was completely voluntary and with parental consent. The researcher personally administered the tests to the participants. The Senior High School students usually came from public schools and were generally of low socioeconomic status as observed. The complete enumeration was used in determining the number of participants to be involved.

There were four research instruments utilized in this study: the Educational Psychological Dyscalculia Screener Test, Mathematics Achievement Test, Mathematics Mental Ability Test and Survey.

Data gathering procedure

To conduct the study, the researcher first secured formal approval by submitting a written request to the School Head of Magsico National High School. Upon receiving approval, the data collection began with the administration of standardized assessments: the Educational Psychological Dyscalculia Screener Test and a Mathematics Mental Ability Test. Once the topics were covered in class, the Mathematics Achievement Test was also administered. Prior to testing, students were oriented on the procedures, followed by the actual administration and immediate checking of results.

Testing was conducted by class section to ensure efficient management. The researcher personally checked and tallied all answer sheets after each test, including the Mathematics Achievement Test. These results were then used to identify students potentially experiencing dyscalculia.

To deepen the data gathered, one-on-one interviews were conducted with selected students during their convenient time. Informed consent was obtained beforehand, ensuring voluntary participation and confidentiality. The interview responses were transcribed and subjected to content analysis.

All collected data were consolidated and subjected to appropriate statistical tools for analysis. This helped address both the main research problem and sub-problems, ultimately forming the basis for findings, conclusions, and recommendations.

Data analysis procedure

The study employed both descriptive and inferential statistics. To evaluate students' performance in the Mathematics Achievement Test and Mental Ability Test, descriptive measures such as frequency, percentage, mean, and standard deviation were utilized. These tools helped determine score distributions and average performance levels.

For the second research question—whether a significant relationship exists between Mathematics Achievement and Mental Ability Test scores among students identified with dyscalculia—the researcher used Pearson's Product-Moment Correlation Coefficient, with the significance level set at 0.05.

For the qualitative component, content analysis was employed to examine the challenges faced by students with dyscalculia, based on their interview responses.

FINDINGS AND DISCUSSION

Performance of the dyscalculic SHS students in the Mathematics examinations

Findings show that one student or 1.45 percent of the participants had an outstanding performance, one student or 1.45 percent had a very satisfactory performance, five students or 7.25 percent had a fairly satisfactory performance, 54 students out of 69 students or 78.26 percent did not meet the expectation. The result reveals that 78.26 percent of the students did not meet the expectation and thus the performance was below the expected 75%. The mean scores of the students were 25.41 with a lower standard deviation of 4.34. These measures mean that their scores are near each other not spread out. But wholistically, the performance of the students in the test was far below the expected performance. The achievement is below the expected 75%. They have difficulty in understanding the definition of proposition and paradox, giving the truth value of proposition and paradoxical statement, identifying statements as a conjunction, disjunction, conditional, biconditional, or negation. This means that these difficulties could be attributed to their lack of comprehension and retention, or they have not mastered the concepts of logic.

A glance at the results of the Mental Math Test shows that the student performed quite low considering that the total number of test items is 32 and their scores range from 4 to 25. The percentage of achievement is only about 92.75% which is below the expected 75%. This shows that there is evidence of learning difficulty in Mathematics.

Correlation of the two variables

The findings show the r -value of the two variables, Mathematics Achievement and Mental Ability Test performance, is 0.619, and its p -value is 0.211, and the decision is to accept H_0 . There is a relationship between the performance of the senior high school students in the Mathematics Achievement Test and the Mathematics Mental Ability Test. This means that a moderate/strong positive correlation would indicate that while both variables tend to go up in response to one another, the relationship is moderate/strong. This result implies that learning Mathematics in any topic is difficult. Since the tests were all about Mathematics, then their scores would relate to the two examinations.

It was also found that attitude towards mathematics is positively and significantly correlated with mathematics base. The study of Vas and Baruah (n.d.) also revealed that Mathematics performances of schools are positively correlated with (a) the academic performance of school indicated by school-leaving pass percentage and (b) with the performances in subjects other than Mathematics. The number of students in a class seems not to affect the mathematics performance of the school (Yap, 2015).

Challenges encountered by senior high school students with dyscalculia

The students identified with dyscalculia consistently expressed a strong dislike for Mathematics. This aversion stemmed largely from their perception of Math as a highly difficult subject that involves extensive problem-solving and memorization of complex formulas. As one student stated, "For me, Math is the most difficult of all the subjects because there's a lot to solve in Math" (Female Student 67). Another echoed this sentiment, saying, "I don't like Math because it gives me a headache... especially when formulas are too long" (Female Student 69).

Several students emphasized the overwhelming nature of equations and the struggle to retain formulas. "There are so many formulas and equations that need to be solved" (Female Student 53), said one respondent, while another added, "I feel that I am confused every time I solve Math. It is also difficult for me to remember formulas" (Female Student 51). These responses illustrate not only cognitive difficulty but also emotional distress associated with Math tasks.

Moreover, many students described a sense of mental exhaustion when dealing with mathematical problems. "For me, Mathematics is very difficult to understand, and it makes our brain puzzled... it's just all numbers" (Female Student 54). The challenge of problem-solving itself was repeatedly mentioned, with students expressing confusion despite partial understanding: "I know I understand, but I get confused about how to solve these problems" (Female Student 34).

Difficulties in computation and a lack of confidence in numerical operations also contributed to their negative attitudes. "I am also weak on computation" (Male Student 2) was a straightforward admission of skill-based limitations.

Beyond the content, classroom experiences further shaped their aversion. Several participants shared how being called to answer on the board triggered fear and anxiety. "It makes me nervous because I think my answers are wrong" (Female Student 48). This fear was magnified by public embarrassment: "I got confused in front of the board, and since then I never liked Math" (Female Student 51), and "I can't explain because I am shy" (Female Student 52).

These emotional reactions reveal the impact of classroom dynamics on student self-perception and learning.

Some also recalled negative emotional encounters such as being scolded or ridiculed. “My teacher and classmates laughed at me because I couldn’t answer” (Male Student 1), and “I was scolded by my teacher for getting a low score” (Female Student 32). Such incidents contribute to math anxiety and hinder students’ willingness to engage.

When asked how Math compares to other subjects, most students agreed it was uniquely challenging. “Math is more difficult compared to other subjects because there are so many problems to solve” (Male Student 13), and “We need to solve long problems in Math, which makes it more difficult than other subjects” (Female Student 66).

CONCLUSIONS

Dyscalculia is a learning disability in Math that can be traced to early childhood as revealed in their experiences. The performance of the senior high school students in Magsico National High School when it comes to Mathematics Achievement and Mathematics Mental Ability Test is below the passing percentage set by the Department of Education which is 75% and is categorized as below the “did not meet the expectation”. The two variables, Mathematics Achievement Test performance and Mathematics Mental Ability Test performance, have a strong relationship. This means that for students with low scores in one exam, there is a higher likelihood of there being a relationship with the other exam. A strong positive correlation indicates that both variables tend to increase in reaction to one another, the relationship is strong. This conclusion implies that learning Mathematics is tough in any subject.

It was also found that the results of the Math Mental Test and the Mathematics Achievement Test led to the conclusion that dyscalculia is affected by the cognitive ability of the brain. Students with dyscalculia struggle to learn Math and hence require mentoring and coaching.

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