

Investigation of the Level of Problems of Dyscalculia in Secondary Schools in Keffi Education Zone, Nasarawa State, Nigeria

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Abstract

This study investigated the level of problems of dyscalculia in secondary schools in Keffi Education zone, Nasarawa State. A quantitative survey design was used for the study. The study population comprised 281 secondary schools Mathematics teachers. There was no sampling involved since the population is manageable and hence the sample size of two hundred and eighty one (281) secondary schools Mathematics teachers was used for the study. This study used an instrument adapted from Checklist of Dyscalculia by Chinn (2020). The reliability coefficient of the instrument obtained was 0.93 using Cronbach's Alpha. Data generated were analyzed using mean and standard deviation and t-test. The results showed among others that; the level of problems of dyscalculia is medium high. Dyscalculia in rural school is higher than urban school. It was recommended among others that; interventions and diagnosis should be carried out in order to improve the capabilities of these students to the maximum.

Keywords: Dyscalculia; Mathematics; Learning difficulties; Secondary school

Introduction

Zero Reject Rule compels the education of students with learning difficulties. Though, it does not particularly address or speak how state and local education agencies must carry out the zero reject rule. Frequently, agencies start to implement it by evaluation to determine if the student has a disability and needs special education (Meral & Turnbull, 2014). In Nigeria, Ministry of Education would introduce Zero Reject Rule or policy in stages to guarantee that students with special needs have access to education without sufficient paperwork. Teachers were expected to be able to cater to all the students with special needs, included the students with learning difficulties (Omar & Ali, 2019). Else, these students may experience double failures, which are educational and social. This will threaten effective participation in school life with a consequent risk of dropping out (Filippello et al., 2019).

Teaching should be conducted and planned properly in order to help the students with learning difficulties such as dyscalculia, so that they could achieve their goal and become productive or creative citizen in future time (Ahmad & Yoong, 2018). More policies and guidelines should be put in place to steer-drive the current integration model to become more flexible to promote inclusion in social, artistic, and vocational domains while continuing to support the students in other academic fields, rather than targeting a total education inclusive model which is too idealistic to achieve (Low et al., 2019). The level of problems of dyscalculia needs to be identified so

as to understand the actual happening in the classrooms situation.

In Nigeria today, the school system in all education levels is not introduced to use screening tools for timely identification. So, quick detection in the educational setting is crucial (Shyielathy et al., 2019).

Data have proven that there are seven categories of learning disability, namely attention deficit hyperactive disorder, Autism Spectrum Disorder (ASD), intellectual disability, slow learner, Down syndrome, dyslexia, and others. Dyscalculia is a specific learning difficulty as common as dyslexia. The signs of dyscalculia can be occurred as early as in primary and secondary schools. Nevertheless, there is lack of awareness among the society about the problems of dyscalculia. It is against this background, the researcher investigated the level of problems of dyscalculia among the Mathematics teachers in secondary schools in Keffi Education zone, Nasarawa State, Nigeria.

Objectives of the Study

The objective of this study was to investigate the level of problems of dyscalculia in secondary schools in Keffi Education zone, Nasarawa State, Nigeria. Specifically, the study sought to:

1. investigate the level of problems of dyscalculia in secondary schools; and
2. investigate the level of problems of dyscalculia with respect to school location (urban and rural).

Research Questions

This study addressed or gave answers to the following research questions:

1. What is the level of problems of dyscalculia in secondary schools in Keffi education zone, Nasarawa State?
2. What is the level of problems of dyscalculia in school based on location in Keffi education zone, Nasarawa State?

Research Hypothesis

The following null hypothesis was tested at 0.05 level of significance:

There is no significant difference for the level of problems of dyscalculia with respect to school location (urban and rural schools) in Keffi Education zone, Nasarawa State.

Literature Review Mathematics

Mathematics is a core and compulsory subject offered in secondary education level. Nevertheless, students might face difficulties in learning it (Yoong & Ahmad, 2018). Some obstacles to learn Mathematics for students with dyscalculia are; inability to work with symbols, Mathematics vocabulary, working memory, short-term memory, speed of processing, long-term memory, sequencing, reversing, cognitive style, generalizing or patterns, and anxiety (Chinn, 2019). Three general cognitive abilities that related to arithmetic performance are working memory, processing speed, and long-term memory. For now, two specific number skills that related to arithmetic performance are approximate and exact numerical systems (Soltani & Mirhosseini, 2019). Mathematics has a central role in students' academic achievement and skills development. Therefore, difficulties in this area may represent a serious problem, both short term and long term (Sousa et al. 2016). As a summary, Mathematics is an important subject in primary and secondary schools. It affects our everyday life and daily activities. Pupils should be able to master the arithmetic skills when they are in primary education. However, Mathematics can be a very difficult subject for students with dyscalculia. Hence, teachers should be able to deal with these students in order to help them to achieve their maximum level in Mathematics learning.

Dyscalculia

In the context of this study, dyscalculia can be referred to the manifestation of vague and unpleasant emotion experienced in a learner which interferes with the manipulation of numbers and solving of Mathematics problems. Several students

who suffer from dyscalculia have little confidence in their ability to study Mathematics. Dyscalculia is yet a new term to be discovered and further explored. Researches in this field of dyscalculia is relatively very low if compare with dyslexia (Yoong & Ahmad, 2020b). This learning difficulty affects between five to eight per cent of primary and secondary school students (Aquil & Ariffin, 2020). Most of the students with dyscalculia in our normal classroom have not been detected (Yoong & Ahmad, 2020a). According to Ahmad and Khoo (2019), students with weak working memory and with difficulties in the rapid processing of information need to be assisted. Besides, Chinn (2019) also mentioned that fractions are included as a top topic for causing difficulties among the topics in Mathematics. To Khing (2016), dyscalculia has made difficult for the students to count numbers in a sequence.

According to Dessemontet et al. (2019), if the students with dyscalculia are not taught specific concepts, such as counting principles, they are unlikely to understand and acquire them. Often, students with dyscalculia always failed in their Mathematics subject and were identified as stupid or lazy. If these students were not being detected, they will be continued to be left behind in the classroom. Therefore, the problem of dyscalculia needs to be identified in order to give the proper intervention and diagnosis to them.

Several studies have been conducted by different researchers with empirical findings reported in reputable Journals, Dissertations and Theses. Orim and Igwe (2017) studied correlates of dyscalculia and learning outcome in Mathematics among SSII students in Obudu, C.R.S- Nigeria. Types of dyscalculia like; sequential, verbal, practognostic and operational dyscalculia were discussed. Tips on how to reduce dyscalculia are listed in the work. The survey research design was employed for the study. A sample of 200 students was randomly drawn for the study. Data generated were subjected to statistical analysis using Pearson product moment correlation analysis at 0.05 level of significance. Results obtained show among others that dyscalculia significantly correlates with students learning in Mathematics. Based on this, it was recommended among others that students should engage in practice, extra-time, graphicalized their work and evaluate their work.

Yoong et.al. (2022) carried out a survey of the problems of dyscalculia in primary schools. The researchers employed quantitative design to carry out the study. Survey method is used to collect the data. Descriptive and inferential statistics are used to analyse the survey data. A study was conducted with 381 primary schools Mathematics teachers in

Malaysia. Means and standard deviation were used to analyse the level of problems of dyscalculia, whereas independent t-test were used to compare the level of problems of dyscalculia between school locations. The results show that the level of problems of dyscalculia is medium high ($M=3.31$, $\sigma=0.97$). On the other hand, the problem of dyscalculia in rural area is slightly higher ($M=3.822$, $\sigma=0.697$) than the urban area ($M=3.717$, $\sigma=0.696$). In short, there is no significant difference for the level of problems of dyscalculia between different school locations ($p=0.147$, $p>0.05$). As a conclusion, interventions and diagnosis need to be carried out in order to improve the capabilities of these pupils to the maximum.

Findings from the previous studies like Fu and Chin (2017), found that the awareness of dyscalculia among educators was very low. The knowledge of dyscalculia is very crucial among teachers and parents as to help their students or children in minimizing with the impact of dyscalculia on their daily lives (Yoong, 2020). Wong, Pang, Chin, and Tan (2014) revealed that there is a significant difference between the prevalence of dyscalculia in rural and urban areas. Students in rural areas presented lower scores in one aspect of number processing if compare with students in rural areas (Santos et al., 2015), as students in rural areas mostly engaged in household works, field and also looking after their siblings which made them away from their studies and cause lack of concentration in their studies, in turn resulting in learning difficulties such as dyscalculia (Khing, 2016).

Materials and Method

This study was carried out in Keffi Education zone, Nasarawa State, Nigeria. The study used a quantitative survey research design. According to Creswell and Creswell (2018), a survey design offers a quantitative description of trends, attitudes, and opinions of a population, or tests for association among variables of a population, by studying a sample of that population. The population of the study comprised 281 teachers teaching in both public and private secondary schools in Keffi Education Zone, Nasarawa State, Nigeria. Thus, 179 of the participants are teaching in urban school, whereas 102 of the participants are teaching in rural schools. There was no sampling, since the entire number of respondents is manageable, hence sample size of 281 was used for the study. This study used an instrument adapted from Checklist of Dyscalculia by Chinn (2020). The original checklist of dyscalculia comprised 31 items. Twenty-nine items were adopted, one item was removed, while one item was adapted to suit the currency of this country, Nigeria. The original item

was (think an item priced at £4.99 is '£4 and a bit' rather than almost £5). Hence there were 30 items that dealt with problems of dyscalculia. The teachers were asked to tick (✓) to express their opinion according to the scale provided. In this five-point likert scale, 1 represents (never), 2 represents (once), 3 represents (once in a while), 4 represents (several times), and 5 represents (many times).

. For the validity, the instrument was subjected to content validity by experts (Mathematics educators) and those in measurement and evaluation and the content validity was computed, the score was found to be 0.87. Since the scores are above 0.70, so the content validity of this questionnaire is high as shown in Table.

Table 1: Score of Content Validity from Three Experts

Expert	E1	E2	E3	Mean
Score	0.86	0.83	0.92	0.87

To determine the reliability of the items in the instrument, 30 Mathematics teachers were involved in the pilot testing. The sample in the pilot test is the secondary school teachers who are teaching Mathematics subject but not part of the main sample for the study. The data of this pilot test was analyzed using Cronbach's Alpha and the reliability index of 0.93. Since the value is higher than 0.7, the recommended value for good internal consistency, therefore the items were considered high, reliable, retained and can be used to carry out the field test as evidenced in Table 2.

Table 2: Cronbach's Alpha Value of the Questionnaire

Cronbach's Alpha	Number of Items
0.93	30

The research instrument was finally administered by the researcher with the help of research assistants (Mathematics class teachers). The data generated was analyzed using descriptive statistics of means and standard deviations and inferential statistics (t-test) for independent samples. To interpret the data generated and to know the level of problems of dyscalculia, the researcher adopted the interpretation scale of average mean by Mustapha (2017). The average mean score of 1.00 to 2.00 is interpreted as (low), 2.01 to 3.00 is interpreted as (medium), 3.01 to 4.00 is interpreted as (medium high), whereas 4.01 to 5.00 is interpreted as (high).

Results

Level of problems of Dyscalculia in Secondary Schools

Table 3: Shows the Interpretation Scale of Average Mean adopted from Mustapha, 2017

Average Mean	Interpretation
1.00-2.00	Low
2.01-3.00	Medium
3.01-4.00	Medium High
4.01-5.00	High

The participants (teachers) were asked to tick (✓) to express their opinion according to the scale

provided. In this five-point likert- scale, 1 represents (never), 2 represents (once), 3 represents (once in a while), 4 represents (several times), and 5 represents (many times). Having responded to, averagely, the range of mean scores for the 30 items computed is between 2.96 to 3.54. Similarly, the range of standard deviation is between 0.847 to 1.765. Generally or overall, the average mean for the problem of dyscalculia is 3.21, which falls between 3.01 to 4.00 and this can be interpreted as medium high.

Difference for the Level of Problems of Dyscalculia with respect to School Location

Table 4: Results of t-test on the Mean Scores and Standard Deviation for the Level of Problems of Dyscalculia with Respect to School Location.

School Location	N	Mean	SD	df	t-cal.	Sig.	Decision
Urban	179	3.523	0.21	279	0.953	0.747	Retained H ₀
Rural	102	3.631	0.25				
Total	281						

Table 4 shows the mean scores and standard deviation for the level of problems of dyscalculia with respect to school location (urban and rural). The data shows that the problem of dyscalculia in rural school is slightly higher (M=3.631 with SD =0.25) than the urban school (M=3.523 with SD = 0.21) in these order, whereas the standard deviation of both school location as observed is almost similar. In fact, both of the school location (urban and rural) schools show the similar level of problems of dyscalculia, which is the level of medium high. However, the calculated t-value = 0.953 with df= 279 at $\alpha = 0.05$ and p-value = 0.747. From the fact that p-value of (0.747) is greater than 0.005 ($p > 0.05$) set as level of significance, hence the null hypothesis was retained. Thus, there was no significant difference for the level of problems of dyscalculia with respect to school location (urban and rural schools) in Keffi Education zone, Nasarawa State, Nigeria. The inference drawn is that both urban and rural secondary schools had an equal level of problems of dyscalculia.

Discussion

This study had investigated the level of problems of dyscalculia in secondary schools in Keffi Education zone, Nasarawa State, Nigeria. The findings of the study had revealed that the problems of dyscalculia are really occurring in our secondary schools. The problem of dyscalculia among these students is in the level of medium high.

Students with dyscalculia poses the characteristics such as those itemized in this survey

questionnaire. This finding is in consonance with Bird (2017) who stated that students with dyscalculia are being unable to remember facts and procedures accurately, or consistently, no matter how many times they try to learn them by heart. According to Ahmad and Khoo (2019), students with weak working memory and with difficulties in the rapid processing of information need to be assisted. Also, Chinn (2019) also stated that fractions are included as a top topic for causing difficulties among the topics in Mathematics. At that point, Khing (2016) stated that dyscalculia has made difficult for the students to count numbers in a sequence. If the students with dyscalculia are not taught specific concepts, such as counting principles, they are unlikely to understand and acquire them (Dessemontet et al., 2019).

The findings of this study has also revealed that students in rural schools have higher mean than the students in urban schools. This finding is in line with Yoong et al.(2022) who revealed that the problem of dyscalculia in rural area is slightly higher than the urban area. This finding actually disagrees with the findings of Wong et al. (2016) who revealed that urban students showed higher evidence of dyscalculia than the rural students.

In addition, the finding further revealed that there is no significant difference for the level of problems of dyscalculia with respect to school location (urban and rural) based on the perceptions of the secondary schools Mathematics teachers. This finding is contradictory with the findings of Wong et al. (2014) who indicated that there is a significant

difference between the prevalence of dyscalculia in rural and urban areas and students in rural areas presented lower scores in one aspect of number processing if compare with students in rural areas (Santos et al., 2015), as students in rural areas mostly engaged in household works, field and also looking after their siblings which made them away from their studies and cause lack of concentration in their studies, in turn resulting in learning difficulties such as dyscalculia (Khing, 2016).

Really, the problems of dyscalculia are happening or occurring among secondary school students. This happens in both urban schools and rural schools. This results also show that the awareness among the teachers for dyscalculia has risen, if compare with the previous findings by Fu and Chin (2017) who showed that the awareness of dyscalculia among educators was very low. In fact, the knowledge of dyscalculia is very important among teachers and parents as to help their students / children in minimizing with the effect of dyscalculia on their daily lives (Yoong, 2020).

Conclusion

Thus far, this study investigated the level of problems of dyscalculia in secondary schools in Keffi Education zone, Nasarawa State, Nigeria. Conclusively, the study revealed that problem of dyscalculia among students is in the level of medium high and this shows that the problems of dyscalculia are actually occurring in secondary schools; the problem of dyscalculia in rural schools is slightly higher than the urban schools; the study also revealed that there was no significant difference for the level of problems of dyscalculia with respect to school location (urban and rural) based on the perceptions of the secondary schools Mathematics teachers.

Recommendations

In line with the findings of this study, the following recommendations were advanced:

1. Government should allocate funds and resources for the students with dyscalculia (learning difficulties).
2. Interventions and diagnosis should be carried out in order to improve the capabilities of these students to the maximum.

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