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Effectiveness of Info-graphics Strategy in Improving Academic Performance of Secondary School Mathematics among Dyslexia and Dyscalculia Students in Kebbi State, Nigeria

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ABSTRACT
Mathematics education transcends the mere acquisition of numerical proficiency; it encompasses a holistic growth encompassing essential values such as rationality, control, and critical thinking. This promising goal of mathematics is often hindered by difficulties some students faced. This study was designed to determine the Effectiveness of Infographics Strategy in Improving Academic Performance of Secondary School Mathematics among Dyslexia and Dyscalculia Students in Kebbi State, Nigeria. The research determined how mathematics academic performance of dyscalculia and dyslexia students was improve when treated with infographics based strategy in Kebbi state. Quasi experimental design was used in this study. The population of the study was the entire senior secondary II students in Kebbi State, Nigeria. Purposive sampling was employed to select the sample for the study. This is because identification of such students was made first. infographics package imbedded in infographics based strategy was deployed for the treatment of experimental groups I and II while conventional approach was used for control groups I. Mathematics Performance Test (MPT) was administer to see the effect of the treatment in both experimental and control groups. The Mathematics Performance Test (MPT) undergo rigorous scrutiny to ensure its validity after which reliability was also determine using split half method and then running Pearson Product Moment Correlation Coefficient (PPMCC) where reliability index of 0.83 was obtained. This study utilized 2023/2024 academic year. Data generated was analyzed using T-test and ANOVA
Keywords: Infographics, Dyscalculia, Dyslexia, Academic Performance

INTRODUCTION

Infographics have grown in popularity as a result of the current information technology revolution, particularly with the widespread usage of smart phones and computers that allow users to interact with infographic parts. Other words used to define infographics included illustrations, interactive photographic information, information designs, and data visualisation. As technology advanced, the usage of infographics became common, and they are now one of the instructional tactics utilized in school teaching and learning. The impact of technology advancement on education has rendered traditional teaching methods ineffective for teaching and learning science and mathematics, necessitating the development of new and advanced teaching methods such as infographics. According to research, the use of infographs appeals to students' visual senses, allowing them to better understand the subject and memorize the concept for longer periods of time (Alrwele, 2017). The phrase "infographics" combines the words "information" with "graphics." An infographic is a visual representation of data or concepts that attempts to convey complicated information to students in a way that is quick to absorb and understand (Smiciklas, 2012). Infographics are mostly visual representations of information. They employ a variety of images to convey ideas and investigate challenges. An infographic is a combination of succinct explanatory text and visual representations that work together to convey a story-like message that is appealing and simple to understand (Alrwele, 2017). The range of representations that can be utilized, including tables, pie charts, bar graphs, zoom boxes, histograms, icons, line charts, tree diagrams, and even photographs, contributes to infographics' appeal and potency.

Infographics are effective independent representations that may rapidly and clearly convey a whole concept "even without accompanying text" (Davis & Quinn, 2014; McDermott, 2014). Infographics are increasingly commonly utilized in STEM education to help students better understand a specific topic or issue. While it may appear that infographics are a relatively new phenomena that has emerged alongside the internet, the truth is that we have used icons, images, and pictures to tell tales and distribute information throughout history (Futterman, 2020). In STEM, infographics are extremely effective for conveying survey data. Mathematical and statistical techniques are essential in STEM teaching. Mathematics and numbers can overwhelm many children, reducing their relevance. When data is presented in the form of an infographic, students may easily derive meaning from it. The primary objective of an infographic is to simplify a complicated notion, making them excellent instructional tools, particularly when delivering an overview of a topic. In addition to clarifying complex ideas, infographics are frequently used to reveal the mechanics of how intricate STEM subjects function. STEM teachers can design infographics to break down complicated concepts in science, technology, and mathematics education. Mathematics and statistics are required in STEM education. Mathematics and numbers can overwhelm many children, losing much of their value. When data is structured in an infographic, students can easily extract meaning from it. The primary function of an infographic is to simplify a complicated notion, making them excellent instructional aids, particularly when delivering an overview of a topic. In addition to clarifying complex ideas, infographics are frequently used to show the mechanics of intricate STEM subjects. STEM teachers can use infographics to break down complex concepts in science, technology, and mathematics education.

Infographics, as an educational approach, are visual graphic displays that highlight the relationship between facts, concepts, or ideas in a learning assignment. The visual representation of infographics provides learners with a structured framework for learning. This helps to focus the learners' attention on important topics and conceptual linkages. The use of such infographics boosts understanding while also improving organization and long-term retention of information. It emphasizes meaningful learning in order to improve learning and reduce boredom among learners (Afify, 2018). Naparin and Saad (2017) defined infographics as visualizations that can convey a considerable quantity of information and transfer knowledge about a topic faster and more effectively than text, depending on the quality and presentation of the graphics.

Mathematics is considered a difficult subject because of its abstract character. The difficulty in learning mathematics is a global concern. It is an extremely significant and crucial subject in school education due to its relevance to everyday human life. As a result, it is taught as a core subject in schools around the world and is considered an important part of the school curriculum. Many

students, particularly in mathematics and science, assume that success requires natural talent or even brilliance, rather than effort and sound techniques.

Problem Statement

It's a common knowledge that mathematics is seen by many as a difficult subject and this difficulty is largely as a result of its abstract nature. The difficulty of learning mathematics is seems to be a worldwide issue despite being it a necessary subject in school system as a result of its linkage to everyday human life. For student to study medical courses, science courses, engineering and other applied science related fields at tertiary institutions, it's pertinent for one have studied and passed mathematics at secondary school level. This made mathematics becoming central to future scientists globally. Despite this importance, the WAEC Chief examiner's report 2023 indicated very poor results in mathematics. This called for concern. If students with a normal learning condition could have issues with mathematics, it's only interesting that students with dyscalculia and dyslexia should be giving a special attention because they have the chances of becoming future doctors and scientists that could break the world. Many students believe that it takes inherent ability or even brilliance to achieve well in mathematics, rather than the utilization of perseverance and good strategies.

Dyscalculia and dyslexia students are not backward, in fact, their learning challenges are surmountable provided the right thing will be done at the right time. Infographics has become widely used along with the current revolution of information technology especially with the extensive use of smart phones and laptops which facilitate interaction between users and infographic elements.

Technological development in education has rendered conventional methods of teaching inadequate for teaching and learning of science and mathematics while creating the need for new and sophisticated methods of teaching like infographics. It's against this background that this study sought to find the Effectiveness of Infographics Strategy in Improving Academic Performance of Secondary School Mathematics among Dyslexia and Dyscalculia Students in Kebbi State, Nigeria.

Thus, this research is potentially significant to dyscalculia and dyslexia students as well as all other stakeholders in educational sector in Nigeria, hence justifying the need for the research.

Objectives of the Study

The main objective of this study is to determine the Effectiveness of Infographics Strategy in Improving Academic Performance of Secondary School Mathematics among Dyslexia and Dyscalculia Students in Kebbi State, Nigeria

Specifically, the objective of the study is to;

- **a.** What is the difference in the mean scores of dyscalculia students taught mathematics using infographics based strategy and conventional approach in Kebbi state.
- **b.** What is the difference in the mean scores of dyslexia students taught mathematics using infographics based strategy and conventional approach in Kebbi state.
- **c.** What is the difference in the mean scores of dyscalculia and dyslexia students taught mathematics using infographics based on gender in Kebbi state.

Research Questions

- **i.** Is there is any significant differences in the academic performance of dyscalculia students taught mathematics using infographics based strategy and conventional approach in Kebbi state ?
- **ii.** Is there is any significant differences in the academic performance of dyslexia students taught mathematics using infographics based strategy and conventional approach in Kebbi state?
- **iii.** Is there is any significant differences in the academic performance of male and female students taught mathematics using infographics based strategy and conventional approach in Kebbi state?

Research Hypotheses

- **i.** There is no significant difference in the mean scores of dyscalculia students taught mathematics using infographics based strategy and conventional approach in Kebbi state
- **ii.** There is no significant difference in the mean scores of dyslexia students taught mathematics using infographics based strategy and conventional approach in Kebbi state

Literature Review

According to Rezaei & Sayadian (2015), People use infographics to quickly communicate a message, to simplify the presentation of large amounts of data, to see data patterns and relationships, and to monitor changes in variables over time. Infographics are found in almost any public environment, traffic signs, subway maps, tag clouds, musical scores and weather charts are just a few examples among a huge number of possibilities. In the enterprise, infographics are used by all levels of management for high-level views of data. Infographics include: bar graphs, pie charts, histograms, line charts, tree diagrams, mind maps, and network diagrams. Such tools are often components of business intelligence software. As the amount of data being amassed in the enterprise and elsewhere increases, infographics are being used more and more frequently to help people understand the information contained in that data.

A lot of studies revealed that the usage of infographics might be an excellent technique for achieving a wide range of instructional predefined objectives in various subjects. Saurbier (2014), for example, employed infographics to teach undergraduate leadership students high-order thinking skills. Finally, she found that infographics helped her students increase their disciplinary competence while also increasing their success, talents, and creativity. Davis and Quinn (2014) went on to say that infographics can help with writing and reading comprehension, as well as clarify hard subjects like science, history, and math, all while boosting critical thinking and synthesis skills.

Furthermore, Dur (2014) observed the current and potential growth of infographics in education and concluded that, in addition to improving students' academic achievement, infographics could help students develop life skills and attitudes such as research, systematic thinking, and teamwork. According to Davidson (2014), infographics can also be used for hands-on learning, problem solving, engagement, and to improve students' reflective and creative thinking.

Infographics are a type of artistic expression that involves converting complex facts, information, and concepts into visually appealing visuals and illustrations, hence improving comprehension and engagement (ALMashaleh, 2023). This strategy is marked by its ability to convey complex and difficult topics in a clear, understandable, and lucid manner. The use of infographics makes information more accessible and palatable (Ismaeel & Al Mulhim, 2021). This visual representation improves the information's persuasiveness and appeal, boosting its long-term retention.

Unlike abstract textual formats, infographics convert data, figures, and letters into visually appealing visuals and illustrations (wijaya & Karyawati, 2021). Sharing and publishing material on social media platforms is not only enjoyable, but it also allows for easy diffusion. Participating in such activities improves cognitive capacities, including critical thinking and visual thinking skills (Suseno,et al. 2022). The use of infographics is related with the acquisition of information via explanations, pictorial depictions, geometric forms, and symbols. Infographics are commonly acknowledged as one of the most efficient ways to communicate scientific information to pupils (Yuruk et al., 2019).

The aforementioned concept is linked to the concept of visual learning, which is becoming increasingly important in the context of today's digital era. The use of infographics allows for extended engagement with a variety of visual information, allowing individuals to actively participate in the processes of analysis and critical reflection on representation and meaning (Wu and Kuwajima, 2022). Educational infographics play an important role in the educational process since they convey scientific data in an audiovisual way. They allow students to compare and reflect while also encouraging deductive reasoning (Khasawaneh & Khasawaneh, 2023). Furthermore, infographics provide a cognitive foundation for people who struggle to make conclusions just from reading. They effectively transmit the contents of discourse and clarify ideas.

However, in recent years, academics have shifted their focus to the reasons of mathematical learning challenges, as well as the learner's procedural and neurological underpinnings. Mathematics is viewed as the result of human activities in the process of adapting to the outside world. The exact acquisition of mathematical abilities requires a wide range of general cognitive capabilities, including auditory and visual working memory, pattern identification, information processing speed, spatial perception, and attention (Kunwar, Shrestha, & Sharma, 2021). These skills enable students to engage in a variety of mathematical activities and performances. Working memory is a powerful predictor of mathematical skills over time, achievement, and growth in mathematics (Kunwar, Shrestha, and Sharma, 2021).

It aids in the performance of rapid and accurate arithmetic calculations between youth and maturity. Researchers have widely agreed that dyscalculia is defined as an impairment in working memory, a brain-related ailment, a hereditary origin, an environment, or a brain difference. These deficiencies impair the learners' mathematical learning skills, notably computation and reasoning. Such challenges of the learner gradually tend to produce irritation when learning mathematical topics related calculation and application.

Dyscalculia

Dyscalculia is one of the important but less prioritized areas in learning mathematics. A group of students about 3–7 percent of school-age are facing problems associated with dyscalculia. They are facing problems related to number comparison, symbols and reasoning.

Dyscalculia is a specific learning difficulty that affects the learner's ability to retain mathematics skills related to calculating numbers, not with every branch of mathematics (Soares, and Patel, 2015). Dyscalculia is an umbrella term used to represent diverse conditions that cause specific difficulties with mathematics such as developmental dyscalculia, mathematical disability, numerical learning disability, and number fact disorder among other terms (Soares, and Patel, 2015). Thus developmental dyscalculia is an inborn condition that affects the ability of the learner to acquire arithmetical skills However, dyscalculia may be caused by accidental brain damage (acquired dyscalculia).

The word 'dyscalculia' has both Greek and Latin origins. The Greek prefix 'dys' means 'badly', while 'calculia', from the Latin 'calculare', means to count (Soares, and Patel, 2015). The term dyscalculia or developmental dyscalculia was first defined by the Czechoslovakian researcher Kosc in 1974 Chinn & Ashcroft, (2017), as difficulty in mathematics as a result of impairment to particular parts of the brain involved in mathematical cognition, but without a general difficulty in cognitive function. In other words, dyscalculia is also known as 'difficulty with numbers', 'being bad at mathematics', or 'number blindness'. It is not the only difficulty with numbers but a more deeply-rooted problem than just being bad at mathematics (Chinn & Ashcroft, 2017). As stated by Chinn & Ashcroft, (2017), the dyscalculic learner always struggles with the common difficulties in mathematics such as remembering number facts and time tables, counting backward in steps, learning to tell the time, calculations involving money and fractions, decimals and percentages. Dyscalculic learners may have difficulty in understanding numbers, number facts, numerical operations place value, the principle of exchange and their mathematical procedures. However, mostly, these difficulties can be overcome with extra support and intensive intervention.

The specific learning difficulty or disorder affects the learners' ability to memorize number-based facts understanding the logical steps needed for solving a mathematical problem and performing daily numerical tasks. Dyscalculia refers to the inability or disorder in basic numerical processes in mathematics (Chinn & Ashcroft, 2017). Such learning disorder affects the learner in numerical processing and computation throughout their life. It is the result of specific disabilities in basic numerical processing, rather than the consequence of deficits in other cognitive abilities (Chinn & Ashcroft, 2017). According to Soares, and Patel, (2015), the specific learning deficits in mathematics have number sense, memorization of arithmetic facts, accurate or fluent calculation and accurate mathematical reasoning. Among them, number sense can be classified as dyscalculia and the core deficit of dyscalculia is the lack of numerosity or the inability to understand the concept of more than/less than (Soares, and Patel, 2015). The term specific learning difficulties or deficits describe a range of disorders in which dyscalculia is one. Therefore, dyscalculia is also considered as the lack of numerosity or an inability to understand the concept of more than/less than.

Types of Dyscalculia

In the field of mathematical learning disability, different researchers have explored their ideas to categorize the major types of dyscalculia concerning the different dimensions of acquiring mathematical ability. In this context, (Kucian, and Von Aster, 2015) are the researcher, who proposes dyscalculia into six uniform categories particularly focusing on the characteristics of knowledge deficits are as follows:

Verbal dyscalculia: It denotes the disturbing ability to designate verbally mathematical terms and relations, such as naming amounts and numbers of things, digits, numbers, operational symbols and

mathematical performances (Kucian, and Von Aster, 2015). In this dyscalculia, children can read or write numbers, but feel difficult to recognize them when presented verbally.

Prognostic dyscalculia: This type of dyscalculia denotes the trouble or difficulty to manipulate mathematical real or pictured objects. Such mathematical manipulations consist of enumerations and comparisons of estimates of quantity. Children with this type of dyscalculia can understand mathematical concepts however they have trouble in listening, comparing, and manipulating mathematical equations.

Lexical dyscalculia: It is a reading disability of mathematical symbols (digits, numbers, operational signs, and written mathematical operations). In this sort of disability, children may have trouble in reading and understanding mathematical symbols, numbers, mathematical expressions, and/or equations.

Graphical dyscalculia: It is a disability in manipulating mathematical symbols in writing. Children can understand; however, they feel trouble while writing or using the correct corresponding symbols. They may also be unable to copy them if written.

Ideognostical dyscalculia: It is difficult to carry out mental calculations and understanding mathematical ideas and relations. Children having Ideognostical dyscalculia feel difficulty with completing mental operations and remembering mathematical concepts after learning them.

Operational dyscalculia: It is the inability to carry out mathematical operations or calculations due to the typical occurrence by an interchange of operations, e.g., doing addition instead of multiplication; subtraction instead of division; or substitution of more complicated operations by simpler ones.

Causes of dyscalculia

There are different views about the causes of dyscalculia. However, researchers generally agreed about dyscalculia as a brain-based condition. Arguably, the specific mathematics learning difficulty (dyscalculia) can be categorized within the cognitive, behavioral and biological aspects and contextualize in teaching and learning mathematics.

The category of the fundamental causes of dyscalculia is presented in Figure 1

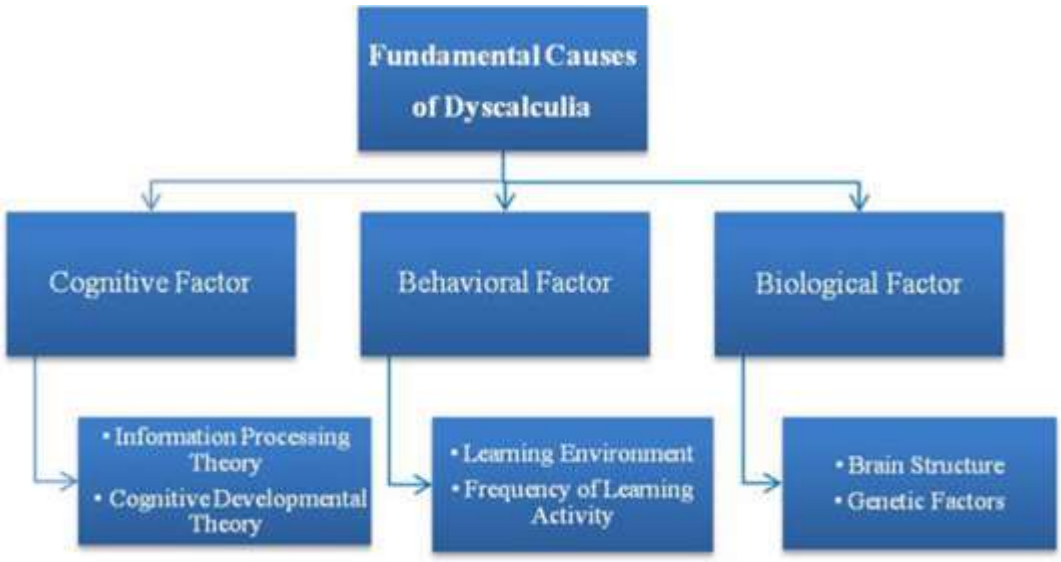

Fig. I; Fundamental causes of dyscalculia

Dyslexia

According to Wajuihan and Naidoo (2011) and Knight (2021), dyslexia is a word coined from the Greek language whereby ‘dys’is defined as difficulty and ‘lexia ‘is associated with words, usually the inability to interpret words. According to the American Psychiatric Association (APA) (2013),

dyslexia is categorized as a specific learning disorder that is explained as having constant trouble in understanding and utilizing learning skills, which is characterized by incorrect, slow and difficulty in reading words, spelling or both. The World Health Organization (WHO (2011)states that dyslexia is an unpredicted and enduring difficulty in gaining beneficial reading abilities even with sufficient cognition, social-cultural possibilities and education offered to the learner. According to the National Joint Committee on Learning Disabilities (NJCLD) (2014) Lyon et al.(2003), dyslexia is a neural condition described in the 1930s that affects an individual's reading, writing, conversation, spelling, computation, and interpretation abilities. According to Wajuihan and Naidoo (2011), European Dyslexia Association (2022), dyslexia is the most common learning disorder with different prevalence in various countries. In Europe, the prevalence of dyslexia is15% of the society, while it was reduced in countries that did not have English as their first language, like China and Japan, to as low as 1%. According to Snowling and Henderson (2012), based on the various studies that had been done on the gender discrepancies in the prevalence of dyslexia indicated that the male-to-female ratio was as high.

Characteristics of Dyslexia

According to Tiril and Okumuş (2022), studies on dyslexia carried out in the 1920s by Samuel Orton, some common characteristic features were discovered, which included challenges learning and recalling words, challenges writing, skipping words while reading, inverse detection of some syllables and numerals 6 and 9, combining sounds of syllables, inappropriate speech, challenge determining the most adequate worn when speaking, difficulties determining direction either up or down and time like before or after, difficulty in determining greater or less than (>or<) and challenges determining hand to arm coordination. According to Philip (2019), students with dyslexia have difficulties with their self-esteem as it is a language-related condition that affects reading, writing, spelling and speech, which can create hindrances in participating in social interactions, thus causing low self-confidence.

Impact of Dyslexia in Understanding Mathematics

According to Zhou (2023), dyslexia affects persons in a number of ways, commonly their skills in reading and writing. Learners with dyslexia have challenges in understanding abstract ideas such as mathematical concepts and hence slow in remembering words. They may invert letters and read words in a reverse manner, thus increasing the challenges of understanding texts and, hence, poor educational advancement. According to Conti-Ramsden et al. (2004) and Willcutt et al. (2007), language is vital in several educational abilities; hence, learners with dyslexia may undergo challenges across the curriculum. Previous research on learners with dyslexia has indicated struggles in several areas like English, arithmetic, and science and the final average grade of such learners is always low.

METHODOLOGY

Design: The study utilized quasi experimental design approach, which will involve pretest and posttest approach. The design will allow the manipulation of one or more variables (referred to as the independent variable), followed by the observation of the resulting effects on the dependent variable. To evaluate their impact on the target group, the researchers employed an infographic-based instructional strategy. The study involved the division of participants into four unique groups which are experimental group I, experimental group II and control groups I and II. The experimental groups I and II were made up of identified students with dyscalculia and dyslexia that will be treated with infographics based instructional strategy while control groups I and II will constitute identified students with dyscalculia and dyslexia that will be treated with conventional approach. Algebra will be used as the mathematical topic for the study. This is because algebra is central to mathematics and require some level of identification of numbers.

Population, sample and sampling technique: Population of the study comprised of the entire senior secondary II students in Kebbi state with a total number of 3,987. Sample of 136 was drawn from the population using purposive sampling techniques. This is necessary because the research involves identifying unique set of students. According to Matazu 2021, in quasi experimental research, minimum of 10 sample are enough for the study. The population of this study are most Hausa

speaking students, with substantial number of Dakarkari, Arewawa and Kambari while some small percentage are Yoruba, Igbo and other minority from across the country. A conscious effort was made to include representative groups of students from across the six educational zones of the state.

Research Instrument, validation and reliability

The utilization of an infographics package imbedded in infographics based strategy was deployed for the treatment of experimental groups I and II while conventional approach was used for control groups I and II with the aim of enhancing academic accomplishment. After the therapy, Mathematics Performance Test (MPT) was administered to see the effect of the treatment in both experimental and control groups. The Mathematics Performance Test (MPT) underwent rigorous scrutiny to ensure its validity after which reliability was also determine using split half method and then running Pearson Product Moment Correlation Coefficient (PPMCC) which gave the reliability of the either half. After, the index is gotten it was also subjected to Brown Prophesy Formula in order to get the reliability of the full instrument. This study used 2023/2024 academic year.

RESULTS

The results of the study were reported based on the research questions.

What is the difference in the mean scores of dyscalculia students taught mathematics using infographics based strategy and conventional approach in Kebbi state?

Table1: Mean and Standard deviation of scores for experimental group 1 and control group II

Groups	N	Mean	SD	MD
Experimental I	45	38.91	6.48	18.04
Control I	27	20.87	6.01	

Table 1 showed the mean scores of experimental group I, with 38.91 and standard deviation of 6.48 with control group having mean score of 20.87 and standard deviation of 6.01. This indicates that there is difference in experimental I and control group with the mean difference of 18.04

What is the difference in the mean scores of dyslexia students taught mathematics using infographics based strategy and conventional approach in Kebbi state?

Table 2: Mean and Standard deviation of scores for experimental group II and control II group

Group	N	Mean	SD	MD
Experimental II	42	77.84	15.98	67.86
Control II	22	9.98	4.01	

Table 2 showed the mean scores of experimental group II, with 77.84 and standard deviation of 15.98 with control group having mean score of 9.98 and standard deviation of 4.01. This indicates that there is difference in experimental II and control group with the mean difference of 67.86

Hypothesis Testing

There is no significant difference in the mean scores of dyscalculia students taught mathematics using infographics based strategy and conventional approach in Kebbi state

Table 3: T-test analysis of mean score of Experimental I and control group

Group	N	Mean	SD	DF	t-cal	*P*-value	Decision
Experimental Group I	45	38.91	6.04			0.001	Rejected
				70	2.81		
Control group I	27	20.87	6.01				

Significant at $\alpha = 0.05$

From the result in table 3, it can be seen that p-value is less than calculated value, this means that students in experimental I group performed significantly better than those in the control group. This indicates that there is statistically significant difference in the performance of those in experimental group I than those in the control group, hence hypothesis is rejected

There is no significant difference in the mean scores of dyslexia students taught mathematics using infographics based strategy and conventional approach in Kebbi state

Table 4: T-test analysis of mean score of Experimental I and control group II

Group	N	Mean	SD	DF	t-cal	*P*-value	Decision
Experimental Group II	42	77.84	15.98			0.000	Rejected
				62	6.43		
Control group II	22	9.98	9.98				

Significant at $\alpha = 0.05$

From the result in table 4, it can be seen that p-value is less than calculated value, this means that students in experimental group II performed significantly better than those in the control group. This indicates that there is statistically significant difference in the performance of those in experimental group II than those in the control group, hence hypothesis is rejected

Table 5: Analysis of Variance (ANOVA) of performance experimental I and experimental II and Gender

	Sum of Square	DF	Mean square	f	Sig.	Decision
Between Group	216.809	1	216.809	.833	.363	Not sig.
Within Groups	41368.967	135	260.12			
Total	41585.776	136				

Table 5 above reveals that dyscalculia students taught using inforgraphics based strategy do not differ from dyslexia students taught using inforgraphics based strategy between male and females. This means that there is no statistical difference between dyscalculia students and gyslexia studnets using inforgraphics based strategy on their gender.

DISCUSSION OF FINDINGS

Dyslexia and dyscalculia are learning disability that can impact various subjects, including math. The signs and symptoms of dyslexia and dyscalculia can differ from one individual to another due to individual differences (Kunwar, 2023). Several typical indicators encompass instances of word skipping and challenges with word recognition, recognizing letters, spelling problems, reading difficulties and identification of numbers (Snowling et al., 2020). These symptoms can emerge during the preschool years, and students diagnosed with dyslexia and or dyscalculia often exhibits a combination of these features (Kunwar, 2023).

The objective of the study was to investigate the effectiveness of infographics strategy in improving academic performance of secondary school mathematics among Dyslexia and Dyscalculia students in Kebbi State, Nigeria. The findings of the study established that there was a difference in the mean scores of dyslexia and dyscalculia over the control group in the favour of the experimental I and

experimental II (Dyscalculia and Dyslexia students) this result corroborate with previous studies, as highlighted by Fonseca (2022) where he pointed out that dyslexia can affect not only reading skills, but also mathematical comprehension. In addition, the conclusions of this research echo the findings of Menezes et al. (2020), who emphasize the importance of pedagogical intervention for students with dyslexia facing mathematical challenges. This further aligns with the research of Kovacs, (2019) that points out that students with dyslexia and dyscalculia may manifest specific difficulties in mathematical task but with appropriate intervention, these challenges can be minimize to a minimum level. The researcher also sought to find out how inforgraphics based strategy correlate with overall performance dyslexia and dyscalculia students according to gender and the result postulate that there is not gender difference on using inforgraphics on students with dyslexia and dyscalculia. The results support an earlier research done by (shin, et al., 2013) which found that sex difference does not affects how learners perform in Mathematics. Furthermore, research done by Kay and Yeo (2018) confirmed that dyslexics and dyscalculia had problems with place values and telling months of the year or time. They also experience problems with mathematical operations as confirmed by Simmons and Singleton (2019) but all these does not depend of their gender.

CONCLUSION

Dyslexia and Dyscalculia are learning disability characterized by difficulties primarily impacting reading, writing and mathematical skills. It can also impact information processing and academic performance. Symptoms of dyslexia and dyscalculia include difficulties with attention processing speed, coordination, multitasking, reading, and comprehension. The study found that there was a statistically significant relationship between mathematics dyslexia and dyscalculia academic performance with the support of inforgraphics based teaching strategy. Also, there was no gender difference.

RECOMMENDATION

The Ministry of Education should formulate policies that will address the needs of learners with dyslexia and dyscalculia. There should be training and re-training of teachers on how to identify students with special needs in mathematics classroom and how to employ strategies (inforgraphics) that could help reduce the difficulties such students usually experience in mathematics classrooms.

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