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Using Conversational Artificial Intelligence Tool in Rebuilding Reading and Spelling on Dyslexic Learners in Nigerian Schools

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ABSTRACT

A specific learning disability with neurological roots is dyslexia; difficulties with precise and fluid word recognition and poor spelling and decoding skills characterise it. Given other cognitive abilities and the presence of effective classroom instruction, these difficulties are typically caused by a deficit in the phonological aspect of language, which is frequently unexpected. Teachers can implement Artificial Intelligence (AI) into educational processes in many different ways, such as by providing creative new chances for tailoring instructional materials to the characteristics of individual pupils and learning preferences and providing cognitive solutions. The study examines how dyslexic students fare in their reading and spelling abilities after conversational AI structures are introduced as teaching tools in Abuja Municipal Area Council, Abuja schools. The study involved forty (40) dyslexic students, both sexes, in grades 1-2 of junior secondary schools, ranging in age from 10 to 12. After receiving instruction from conventional teaching techniques and a conversational AI intervention, their spelling, reading, and writing achievement was tested. The performances of the experimental group (20 dyslexic students) and the control group (20 dyslexic students) after receiving traditional instruction were compared. Before the intervention, both groups of students reading, spelling, and writing abilities were assessed through a pre-assessment test. After six (6) weeks, both groups were involved in post-tests to evaluate their performance on reading, spelling, and writing skills. Compared to students who received instruction without using artificial intelligence, the study found that learners' spelling and reading abilities improved after the intervention program. The effectiveness of conversational AI as a teaching tool for dyslexic students was evaluated by the learners' tutors as well. The study offers conceptual underpinnings for dyslexia-related issues and potential avenues for AI intervention.

Keynote: Conversational Artificial Intelligence, Tools, Rebuilding, Spelling, Writing, Reading, Dyslexia Learn

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1. Introduction

"Educational technology" is a field of technology that focuses on making and using tools, like software, hardware, and procedures, to help with teaching and learning. It involves using a computer to teach and create educational materials, online assignment submissions, multimedia presentations, simulations, mobile applications, educational games, or an online degree platform. Technology integration is using tech tools in a larger academic setting so students can use their tech skills to learn and solve problems. Technology integration into teaching and learning has helped students improve in school and keep their attention by using exciting content. Technology changes how people learn when it is integrated into the curriculum (Ogunlade, 2019)

ICT has made a big difference in how well students do in school, how well teachers can do their jobs, and how well students can move around intellectually. Because of this, a flexible learning environment has been made, and education has moved beyond the physical limits of classrooms (National Institute of Multimedia Education in Japan 2010, Linways 2017). This considerable influence has prompted researchers to look at further ICT and technological applications in education, particularly how this integration can benefit students with impairments.

Many different kinds of learners have learning disabilities, like hearing impairment or vision impairment or other ways of understanding things; this can make it hard to learn new things and put skills to use in real life. Typical learning difficulties include reasoning, speaking, listening, writing, and math (Gina, Melinda, and Jeanne, 2017).

Disabilities Education is a condition that impairs one or more of the critical psychological processes necessary for understanding or using spoken or written language. The inability to think, speak, read, write, spell, or execute mathematical calculations may be a symptom of this illness. Under this general term, dyslexia, brain injury, mild brain dysfunction, and developmental aphasia are all included. Such a word does not have a learning issue primarily brought on by emotional disturbance, environmental disadvantage, cultural disadvantage, economic disadvantage, or visual, hearing, or motor impairments. Dyslexia, dyscalculia, dysgraphia, a visual processing deficit, an auditory processing deficit, attention deficit/hyperactivity disorder (ADHD), executive functioning deficits, non-verbal learning disabilities, and other similar conditions are the most prevalent types of specialised learning disabilities. However, the examination of dyslexic learners is the principal objective of this study. It is not linked to IQ, but dyslexia, a language-processing disease, can make it difficult to read, write, spell, and occasionally even talk when there is a problem with how the brain perceives graphic symbols. Several conditions connected to dyslexia, including attention deficit disorder, dyspraxia (difficulty with activities requiring coordination and movement), and dyscalculia (problems performing mathematical computations due to a neurological condition), can occasionally coexist. Dyslexia only applies to people who struggle to learn to read while receiving sufficient training; it does not apply to people who cannot read. Dyslexia is a "disability" legally recognised; it is not a "disease" that can be treated or healed. Interventions are only helpful. For instance, phrases like add, plus, subtract, increase, and "total" must be used in computations. Because over 90% of dyslexic children fail in at least some areas of math, learners must first understand learning. Additionally, there might be problems with memory, ambiguity in directions, sequencing, visual/perceptual skills, and word skills. Some challenges that require numerous steps or a heavy workload can be short-term memory-related (Noonoo, 2017).

Males appear more likely than females to have dyslexia, with a ratio between 3:1 and 5:1. According to data, dyslexia is genetically based in at least two-thirds of instances. Still, the circumstances surrounding birth can also have a significant impact. Most specialists concur that 4% of the population is significantly

affected. This number is based on the proportion of students with regular schooling who, by the end of primary school, have literacy development that is more than two years behind levels consistent with their chronological age and mental age but does not have significant emotional, social, or medical etiologies (Nwasor, 2013). However, 6% of people could experience milder effects (such as due to this disability's variable expressions in spelling).

Failure to recognise familiar words, poor comprehension and hesitant and difficult reading are all recognised symptoms of dyslexia. These students struggle to identify the main ideas of the texts they read. They may also have problems with missing lines, omitting words, or adding extra words to the text. Poor standards of written work with sloppy handwriting and confusion in spelling are two specific reporting problems that people encounter. They have more trouble with grammar, punctuation, and taking notes than regular readers do. Elazab Elshazly (2016) observed that impaired short-term memory and visual processing are additional signs of the condition, and they may have trouble planning their schedules for work and personal activities. It is well known that students with dyslexia have difficulty remembering phonemes.

The learner gets frustrated because it's hard to learn to read, and these problems, thought to be the main signs of dyslexia, also make it hard to get along with other people. The learner may also show symptoms of depression and low self-esteem. Additionally, if behavioural issues persist, the learner may lose interest in school and grow to detest it.

Teachers may jeopardise their students' academic success if the problem is unresolved. Therefore, emotional symptoms and signs are equally important to pay attention to as academic ones. (Martin et al., 2007; Ikediashi, 2012).

Interventions that use tried-and-true methods to help dyslexic students learn and reach high standards have been implemented recently. This plan contains the idea that using more than one sense in the educational process helps dyslexic students receive, process, and engage with the material in a lasting way.

Process for enhancing a student's learning through movement, touch, sight, and hearing. When using assistive technologies like audio tapes for recording lessons that can be written up later, such as voice-activated software, pocket spell checkers will return a correctly spelt match, which will help learners commit correct spellings to memory and increase their confidence in writing and spelling.

They give kids with dyslexia enough time to finish their homework because they may have to work much harder than their peers to get it done.

Because dyslexic students may have worse spelling and grammar proficiency than their peers, grades are given based on effort and ideas. Their creativity and mental processes are sometimes more developed and expressed than other students.

Setting up a systematic reading program involves repetition and slowly adding new words. It does not include giving kids books that are too hard to read. Instead, it talks about educational games and mind-mapping software, which is a tool that can help people communicate visually (Liz Burton, 2016).

When kinesthetic activities are combined with verbal and aural presentations of the subject, these tactics may assist students' recollections and make their phonemes more distinct and tactile. In addition, the learner's performance and learning attitude will also generally increase when more techniques are

offered and added to the working memory, increasing the likelihood that the information being learned will stay long enough to be stored in long-term memory (Ogunlade, Olowoyeye, & Ogunlade, 2018; Hayiou-Thomas, 2006).

Understanding human intellect in all its forms is one of computing science's goals. Over the past 50 years, this quest has inspired many academics to develop the discipline of artificial intelligence (Athanasios & Rodi-Eleni, 2018). The concept of a machine that is intelligent in terms of both practical and societal implications is referred to as artificial intelligence. "The study of artificially recreated human intelligence and behaviour is known as artificial intelligence, such that the outcome bears to its design a tolerable level of rationality," according to Rainer Winkler (2018), is a commonly used definition. The tale of rationality may surpass humans for specialised and clearly defined tasks (Stefan, Popenici, & Sharon, 2017).

Researchers started looking at areas where artificial intelligence and education interact, and they support the notion that these two domains can successfully complement one another (Athanasios & Rodi-Eleni 2018). So, artificial intelligence could be seen as a powerful tool for helping people learn what they want to know.

AI is expected to help with education by making it easier to use this technology to learn analytics in these situations because it could score test results in a way that doesn't depend on the teacher's opinion. Based on test results, AI can quickly learn to categorise students. Additionally, AI can be incorporated into understanding processes in various ways, such as by offering exciting new opportunities for adapting learning content based on students' characteristics and learning styles and by providing cognitive solutions—cognitive tools that give teachers information about students' preferences, learning techniques, and learning methods—and the individual's preferences. Measuring individual development than average performance in standardised tests may be more critical. (Tuomi, 2018). Automated grading may adapt to the accomplishments and difficulties of students to assess their needs, encouraging them to work at their speed and developing accurate and reliable indicators to monitor their development, including notoriously challenging qualities to evaluate. AI-driven evaluations will be integrated into engaging learning activities like games and team projects (Becker, 2017).

More crucially, assisting people with learning difficulties and explicitly assist dyslexic students in overcoming learning obstacles Current AI systems, however, are restricted to specific applications and still have drawbacks, including a lack of "common sense," the capacity to assess information outside the scope of their prior knowledge because they only rely on the data provided to them, and emotional intelligence restrictions. In addition, AI is not yet accurate and complete (Ellen et al. 2019).

1.1. Statement of the Problem

According to society, good reading, writing, and spelling skills are essential for success in a professional setting; this calls for acquiring new knowledge and becoming tech-savvy (Thomson, 2010). Almost two decades ago, English-speaking countries began implementing best practices for teaching dyslexic students and training instructors. Numerous state-of-the-art educational technologies have been used to support and engage dyslexic students; without considering the students' potential, these technologies have led to multiple retrogressions. These technologies do not, however, result in dynamic inclusion for dyslexic students. Most of the technologies in use today are either too basic or too ineffective to meet the complex needs of dyslexic learners. An essential tool for helping dyslexic students is a technique or technology that can identify the condition and provide treatment options. Dyslexic children have experienced the situation in a variety of ways.

This study addresses the following issues to encourage dynamic inclusion for dyslexic learners:

There is a lack of understanding and knowledge regarding this learning issue.

Regarding young learners, there are insufficient abilities or information to help kids with this impairment, which has been only recently diagnosed.

People with dyslexia receive little to no support outside of school because reading and writing occur outside the classroom.

Numerous educational applications have incorporated artificial intelligence; these applications can help develop diagnostic and intervention techniques for dyslexic children to improve the quality of their educational experience.

1.2. Objectives of the study

This study will be conducted to identify potential ways AI can assist dyslexic learners, implement a developed AI structure to test the degree of improvement the learners will experience using the AI, and also examine the learners' opinions of the AI structure in light of the apparent need for research and practice.

Research Questions

Based on the above-stated objectives, the following research questions will be answered in the study:

1. Can conversational artificial intelligence assist learners with dyslexia?
2. Is conversational AI an effective tool to help dyslexic learners with spelling, writing, and reading?

1.3. Research Hypothesis

This research proposes the hypothesis below;

Ho1 Is there a significant difference between dyslexia students taught with conversational AI and those who are not in terms of their academic performance?

Ho2 Is there a significant difference between the dyslexia learner’s Tutors that use conversational AI and those ones that did not for effective teaching?

2. Methodology

The study used a quasi-experimental research design because it was the best way to answer the questions and meet its goals. First, the school population was vetted to extract dyslexic learners or learners with similar difficulties; the removed population was then randomly assigned to the experimental and control groups. The age range of the population was 10–12, all of whom experienced similar learning difficulties.

This study was aimed at students with dyslexia in schools in the Abuja Municipal Area Council (AMAC). A test designed by Ronald D. Davis and the Davis Dyslexia Association International was administered to the population to determine if the learners had dyslexia or similar learning difficulties. The identified dyslexic population was randomly selected for an experiment and a control group.

This technique was carried out in four schools in the AMAC area, scooping forty (40) dyslexic learners, both male and female, who had similar reading and spelling difficulties and were selected to participate in the study.

A pre-test was administered that contained varying spelling words and different lengths of comprehension passages. The outcome was to determine the entry-level of the learners; this also indicated areas of learning difficulties. The learning content was a range of spelling words, comprehension passages, phoneme development, phonological awareness activities, and varying activities to improve phonological processing strength.

Both groups were taught the same things using the same teaching methods. However, during the six weeks of training, the experimental group was also led by a conversational AI. A post-test was administered to both groups at the end of the movement. The learners' tutors were involved in the experiment and were given questionnaires to grade the AI.

First, a tool for extracting data was made by determining what information needed to be removed; this lets findings be shown in a diagram. Then, descriptive and inferential statistics were used to analyze and interpret the data collected for the study. The following two stages are appraisal and synthesis of the data. The first research instrument was analyzed using a T-test, which can be used to compare two means or proportions. The t-test is appropriate because it reaches the difference in the academic performance of dyslexic learners taught with conversational artificial intelligence and the control group to find a significant difference. The T-test was also used to find a substantial difference between dyslexic tutors using conversational artificial intelligence and those without interest.

The second research instrument was divided into three sections, and a mean analysis was used to present and synthesize studies of the raw data. The sections are the following:

The mean analysis shows how artificial intelligence assists learners with dyslexia.

Mean analysis shows conversational artificial intelligence as an effective tool to help dyslexic learners with spelling, phonics, and reading.

Mean analysis showing the opinions of dyslexic tutors' mean ratings on the implemented conversational AI for teaching dyslexic learners.

3. Findings

The two research questions raised in the study were answered descriptively.

Research Question 1: Can Artificial Intelligence assist Learners with dyslexia?

Table 1: *Mean Analysis Showing How Conversational Artificial Intelligence Assists Learners with Dyslexia*

S/N	Item	5	4	3	2	1	Mean	Remarks
1	The conversational AI was intelligent	9	3	-	-	-	4.75	Agree
2	The audio quality was good	12	-	-	-	-	5.00	Agree
3	The AI could understand human language with ease	11	1	-	-	-	4.92	Agree
4	The conversational AI was highly interactive	2	10	-	-	-	4.17	Agree
Grand Mean							**4.71**	**Agree**

From Table 1 above, it could be observed that mean scores of 4.75, 5.00, 4.92 and 4.17 respectively were in agreement with items 1, 2, 3 and 4. The grand mean of 4.71 indicated that all the respondents agreed that the conversational AI was intelligent, audio quality was good, AI could understand human language with ease and conversational AI was highly interactive.

Research Question 2: Is conversational AI an effective tool to help dyslexic learners with spelling, writing, and reading?

Table 2: *Mean Analysis Showing Conversational Artificial Intelligence as an Effective Tool to Help Dyslexic Learners with Spelling, Phonic and Reading*

S/N	Item	5	4	3	2	1	Mean	Remarks
1	Learners responded well to the AI	12	-	-	-	-	5.00	Agree
2	Learners were more attentive during the teaching	12	-	-	-	-	5.00	Agree
3	Learners were at ease when using the AI	12	-	-	-	-	5.00	Agree
4	The AI was of efficient assistance to the learners	6	6	-	-	-	4.50	Agree
Grand Mean							**4.88**	**Agree**

From Table 2 above, it could be observed that mean scores of 5.00, 5.00, 5.00 and 4.50 respectively were in agreement with items 1, 2, 3 and 4. The grand mean of 4.88 indicated that all the

respondents agreed that learners responded well to the AI, they were more attentive during the teaching, they were at ease when using the AI and AI was of efficient assistance to the learners.

3.1. Hypotheses Testing

The two research hypotheses earlier formulated were tested at 0.05 level of level of significance.

H01: There is no significant difference in the academic performance of dyslexic learners taught with conversational Artificial Intelligence and control group

Table 3: *T-test Results for Experimental and Control Group*

Group	N	Mean	Std. deviation	Df	$t\text{-}_{cal}$	t-tab	Sig ($P\text{-}_{cal}$)	Remarks
Experimental	10	31.30	1.947					
				18	6.556	1.734	0.000	Reject Ho_1
Control	10	22.60	3.718					

Significant at df=18; $P \leq 0.05$, $t\text{-}_{calculated} > t\text{-}_{tabulated}$

Table 3 shows a t-test analysis of the significant difference in the academic performance of dyslexic learners taught with conversational Artificial Intelligence and the control group. The t-cal value 6.556 is greater than the t-tab value 1.734, given 18 degrees of freedom at a 0.05 significance level. The t-cal value is significant since it is greater than the t-tab value; the null hypothesis is rejected. It showed a substantial difference in the academic performance of dyslexic learners taught with conversational Artificial Intelligence and the control group.

H02: There is no significant difference between dyslexic tutors using Artificial conversational intelligence and those who don't have an interest

Table 4: *T-test Results for Tutors' Views*

Group	N	Mean	Std. deviation	Df	$t\text{-}_{cal}$	$t\text{-}_{tab}$	Sig ($P\text{-}_{cal}$)	Remarks
Experimental	10	29.10	0.876					
				18	32.371	1.734	0.000	Reject Ho_1
Control	10	13.05	1.301					

Significant at df=18; $P \leq 0.05$, $t\text{-}_{calculated} > t\text{-}_{tabulated}$

Table 4 shows a t-test analysis of the significant difference between dyslexic tutors using Artificial conversational intelligence and those without interest. The t-cal value of 32.371 was more significant than the t-tab value of 1.734, given 18 degrees of freedom at a 0.05 significance level. The t-cal value was substantial and more significant than the t-tab value, and the null hypothesis was rejected. It was

found that there was a significant difference between dyslexic tutors using Artificial conversational intelligence and those who don't have an interest.

4. Discussion of Findings

Research indicates that the traditional teaching method is ineffective for learners with dyslexia as it tends to be stereotypical and teacher-centred and doesn't give room for the patience required by people with dyslexia. The AI interventions available can help people with dyslexia learn better. The research highlights the intricate problems people with dyslexia face, such as phonological processing, verbal working memory and processing speed. Learners with dyslexia may also have difficulties memorising and letter identification challenges. They also have problems with a visual attention span that significantly affects their reading skill; all of these problems cause a lag in their academic achievement.

Anxiety arises when these learners or others do not fully understand the nature of their learning disability. As a result, this causes them to blame themselves for their difficulties. Self-doubt arises, and self-recrimination erodes a person's self-esteem, making them less able to tolerate the challenges of school, work, or social interactions and more stressed and anxious. These learners spend more hours with academic work than their peers or in special programs. These often follow with little success, agonisingly slow and frustrating, rendering them emotionally fragile and vulnerable. Dyslexic learners are sometimes subjected to excessive pressure to succeed (or excel) without the proper support or training or continuously compared to siblings, classmates, or co-workers, making them embarrassed, cautious, and defensive. Some people with dyslexia eventually become withdrawn or become social isolates. Confronting regularly with the tasks like reading, spelling, or math can be extremely difficult for people with dyslexia. They can have increased confidence by mastering their job or experiencing success at jobs they regularly have problems with.

Conversational AI is suitable as an instructional aid that can effectively augment learning content and assist people with dyslexia either in the classroom or outside its walls. Measuring a significant level of improved performances among the dyslexic learners that used conversational AI, it can be said that AI can be a tool of immense benefit to the learners. Furthermore, inferring from other reviewed literature provides real-time solutions to long-existing issues around dyslexic education.

Currently, no studies have employed the comprehensive strength of AI, combining all possible interventions ranging from diagnosis, cognitive functions, behavioural aid and personalised learning. This work only focused on improving linguistic skills in spelling, reading and comprehension. Researchers in Nigeria must go beyond this and consider all underlying problems faced by people with dyslexia, either in cognitive functions or behavioural, which can contribute to improving academic performance and better ways to manage the learning process with better, significantly improved outcomes.

5. Recommendations

The advancement holds potential for AI, a growing field with immense possibilities; it is considered a promising educational aiding tool for all learners. Its advances welcome limitless applications in helping dyslexic learners and education in general. The following are recommendations:

1. Exploration of a larger dataset using a wider experimental population, extensive learning content and other forms of AI other than conversational AI for optimal performance.

2. AI can be implemented as a personalised learning tool to learn new content anywhere and anytime instead of augmenting classroom teaching.

3. Adaptation of AI across other learning difficulties experienced by dyslexic learners and generally other learning difficulties not necessarily associated with dyslexia.

6. Statements

6. 1. Conflict of Interest

There is no conflict of interest in this study

6.2. Contributions

It is stated that each author has equally contribute to this study.

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