

Information and Communication Technology, Braille Literacy and Academic Performance of Secondary School Students with Visual Impairment in Ogun State, Nigeria

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Abstract

The study examined the influence of information and communication technology (ICT) and braille literacy on the academic performance of secondary school students with visual impairment in Ogun state. The study adopted a survey research design of expos facto type. Questionnaires were used to collect data. Multistage sampling procedure was used to select a total of number of one hundred (100) secondary school students with visual impairment in Ogun State, Nigeria who participated in the study. Two hypotheses were formulated and tested using Multiple Regression statistical tools at .05 level of significance. The result revealed that ICT and braille literacy had significant joint influence on academic performance of students with visual impairment in Ogun State, Nigeria ($F_{(2,97)} = 5.680$; $p < 0.05$). The result also indicated that ICT and braille literacy made significant independent contribution to academic performance of students with visual impairment in Ogun state, Nigeria ($\beta = -0.268$, $t = 2.787$, $p < 0.05$; $\beta = 0.168$, $t = 1.748$; $p < 0.05$). The study concluded that there was significant joint and relative contribution of ICT and braille literacy on academic performance of students with visual impairment in Ogun state, Nigeria. Therefore, the study recommended that Government, non-governmental organisations and educational stakeholders should take cognisance of influence of ICT and braille literacy in the development of any intervention to improve academic performance of students with visual impairment.

Keywords

Information and Communication Technology, Braille Literacy, Academic Performance, Visual Impairment

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1. Introduction

Generally, people living with disabilities are recognized as a group of vulnerable people. Disability is described as impairment in the human body structure or function, activity limitations, and participation restrictions [1; 2]. A significant 15% of the world's population lives with various forms of disability, out of which 39 million were blind and 246 million

were having low vision [1; 2]. Persons with visual impairment are mostly categorized as individuals with functional limitation of the eye(s) or visual system and can manifest as reduced visual acuity or contrast sensitivity, visual field loss, photophobia, diplopia, visual distortion, visual perceptual difficulties, or any combination of the above. These functional limitations can result from congenital (e.g., prenatal or postnatal trauma, genetic or developmental abnormalities), hereditary (e.g., retinitis

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pigmentosa or Stargardt's macular degeneration), or acquired conditions (e.g., ocular infection or disease, trauma, age-related changes, or systemic disease) [3].

Deficiency of the visual system present at birth, or developing shortly thereafter, has been observed to adversely affect development. Visual impairment presents at childhood has been observed to often developmentally delay in the areas of gross and fine motor skills and perception [4]. For students, the inability to read standard-sized print, to see the chalkboard and to discriminate color can have a significant impact on their cognition in the area of educational development. This impact could result to poor academic performance and makes person with visual impairment to experience difficulty in securing and maintaining employment as well as maintaining a home and fulfilling family and social obligations in a developing country like Nigeria that does not have adequate program for people with visual impairment. This makes their academic performance an important factor to address. It was observed that education is a tool to empower the people with visual impairment to live an independent life.

Improving the Academic performance of students with visual impairment visual remains concern to educational stakeholder and society at large. It has long been recognized as one of the important goals of education. Meanwhile, academic performance of a student with visual impairment could be defined as the learning outcomes of the child. This includes the knowledge, skills and ideas, acquired and obtained through their course of study within and outside the classroom situation [5]. It is the outcome of determination and hard work of student in academic pursuit. Academic achievement of students especially at the secondary school level is not only a reference to the capacity or potential for achieving results of schools but determinant of the future of youths in a nation. It is about student meeting a short or long term educational goals [6]. This makes it important because it prepares students for future careers. The degree to which student has achieved specific goals which seem to be the focus of academic excellence in the educational system have tendency to determine their ability to achieve their career and future set targets.

However, academic performance of students especially at the higher educational level is not only restricted to memorizing of what has been taught and pass both formative and summative assessment at the end of each academic session, but been developed in some employability skills because development in some skills at such level is a major determinant of the future of students. Academic performance have become a phenomenon of interest to all educational stakeholders and this account for the reason why researchers have been working hard to untangle factors that militate

against excellent academic performance [7].

In Nigeria, to identify some major causes of low academic performances in students with visual impairment, Ajila and Olutola [8] carried out research and found some of the identified causes to include; inadequate teachers, problem of inadequate facilities in the school, problems caused by poor parental background, unfavorable government policies and low educational sector funding. This is an indication that researchers has proffered recommendations to identified problems, but poor academic performance still persist which is an indication that there are some influencing factors which previous studies have not examined. Two variables were identified which could influence or contribute to academic performance of students with visual impairment. The variables are braille literacy and information and communication technology (ICT)

Many students with visual impairment learn to read and write by using the Braille system of raised dots that can be read by touch rather than sight. They may also use a special laptop computer that allows them to take notes in Braille and print in Braille or English. Sophisticated electronic devices can also convert print into a form that is readable by students with visual impairment. Some computers can scan printed text for students with visual impairment and read it aloud by means of a synthetic voice. Most students with visual impairments have some functional vision and can often read by using large-print materials [9] depending on their literacy level. In Nigeria, students with visual impairment usually receive education that is incomparable to their sighted peers because of their visual related problems. This could influence their performance when they are subjected to the same examination with their sighted peer. Such examination could be West African Certificate Examination or National Examination Council. National Bureau of statistic in Nigeria reported that approximately less than 20% of all Nigerian students with visual impairment managed to gain entrance to universities. It can be assumed that those who gained admission to university represent highly selective ones because they have managed to do so despite their impairment and greater difficulty in accessing written information. The observable poor academic performance among students with visual impairment could be attributed to their difficulty in accessing written information as a result of their low level of braille literacy.

Braille literacy of students with visual impairment are fundamental to their informed decision-making, personal empowerment, active and passive participation in the local and global social community [1], and therefore an irreplaceable means to achieving their full life potential. For a long period of time, written language was due to the lack of the third dimension unavailable to persons with visual

impairment until Louis Braille's invention of the six-dot tactile system in the 19th century which makes persons with visual impairment to be able to read and write independently. For students with visual impairment, Braille is an independent writing system, rather than a code of printed orthography [10] and its cells are not the only thing to appear in braille text. A full braille cell includes six raised dots arranged in two columns, each column having three dots. The dot positions are identified by numbers from one to six [11]. There are 64 possible solutions using zero or more dots. A cell can be used to represent a letter, number, punctuation mark, or even a word [11].

Braille is the primary medium that enables students with visual impairment to continuously participate in teaching and learning process, personal development [12] and in that way increase their potential for independence through employment, creativity, and other forms of success. Braille assists students with visual impairment to read academic materials and to study. Moreover, it was observed that level of braille literacy could influence the academic performance of students with hearing impairment.

Information and communications technology (ICT) is another identified variable which could influence academic performance of student with hearing impairment. Moreover, ICT is an umbrella term for all communication device or application, encompassing: radio, television, satellite system, cellular phones, computer and network hardware and software as well as the various services and applications associated with them, such as videoconferencing and distance learning. ICTs are often spoken of in a particular context, such as ICTs in education, health care, or libraries [13]. According to the European Commission [14], the importance of ICTs in relation to assisting persons with visual impairment lies in the technology itself than in its ability to create greater access to information and communication. Many countries around the world have established organisations for the promotion of ICTs, because it is issue of concern that unless less technologically advanced areas have a chance to catch up, the increasing technological advances in developed nations will only serve to exacerbate the already-existing economic gap between technologically developed countries and technologically developing countries.

Information and communication technology (ICT) was observed as an important tool which could enhances academic performance of students with visual impairment. ICTs like visually assisted technologies such as: Screen reader (An application that converts text on the screen to speech), screen magnifier (An application that was made for not totally blind but those who have a weak sight to assist in magnifying texts and pictures on the screen up to many

times), speech recognition system (an application that translate spoken words into text), Advanced Closed-Circuit Television (A device that enlarges printing text or written materials for visually impaired persons to read), optical recognition software (An application that converts images of typed, handwritten or printed text into machine-encoded text) etc,. These technologies are developed for persons with visual impairment to improve, evaluate, store, produce, present and exchange information. The development of these technologies has made the accessibility to academic resources and information easy among students with visual impairment. Meanwhile, the level of knowledge and utilization of the aforementioned ICTs by students with visual impairment could influence their level of academic performance and previous studies have not adequately addressed it. Therefore, the present study examined the influence of ICTs and braille literacy on academic performance of secondary school students with visual impairment in Ogun State, Nigeria.

1.1. Purpose of the Study

The main purpose of this study was to examine the influence of ICT and braille literacy on academic performance of secondary school students with visual impairment in Ogun State, Nigeria.

The study specifically ascertained:

- i. the joint contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun State, Nigeria.
- ii. the relative contribution of each of ICT and braille literacy to academic performance of students with visual impairment in Ogun State, Nigeria.

1.2. Research Hypotheses

The following hypotheses were raised:

1. There is no significant joint contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun State, Nigeria.
2. There is no significant relative contribution of each of ICT and braille literacy to academic performance of students with visual impairment in Ogun State, Nigeria.

2. Method

2.1. Design

The study adopted the descriptive research design of expos facto type. The design was adopted because the researchers did not manipulate any variables of interest. The researchers only assessed the variables of the study and relate them

together to observe whether there is significant relationship or not.

2.1.1. Population

The population for this study consisted of all students with visual impairment in Ogun State, Nigeria.

2.1.2. Sample and Sampling Techniques

The study adopted multi-stage sampling procedure: The first stage involved the use of purposive sampling technique to purposively select three (3) schools that houses students with visual impairment in Ogun State, Nigeria.

Second stage involved the use of simple random sampling technique to select one hundred (100) students with visual impairment from the three (3) selected secondary schools in Ogun State. In all, one hundred (100) respondents were randomly selected and participated in the study.

2.2. Instrument

Questionnaires were used for data collection. The questionnaires were divided into five sections which are; A, B, C, D. section. The following are the instruments used for data collection:

1. Academic Achievement Assessment Tool
2. ICT (Information communication technology) scale
3. Braille literacy scale

Description of Instrument

Academic Achievement test: The Academic achievement test was adopted from standardized test developed by West African examination. This achievement test consists of 20 items to assess level of academic performance among students with visual impairment. The achievement test consists of 10 questions on mathematics and 10 questions on English language. The higher the score on the achievement test, the higher the academic performance and vice versa.

ICT (Information Communication Technology) Literacy Scale: ICT (Information communication technology) literacy scale was self-developed scale. This instrument was developed to access ICT (Information communication technology) literacy level of student with visual impairment.

This scale consisted of 16 items with a response format ranging from Strongly Agree = 5 to Strongly Disagree = 1. The scale satisfied both face and content validity by expert in the field of technology and test and measurement. The scale had internal consistency coefficient value of 0.78.

Braille literacy scale: Braille literacy scale was self-developed scale. This instrument was developed to access Braille literacy level of student with visual impairment. This scale consisted of 12 items with a response format ranging from Strongly Agree = 5 to Strongly Disagree = 1. The scale satisfied both face and content validity by expert in the field of technology and test and measurement. The scale had internal consistency coefficient value of 0.61.

2.3. Procedure of Data Collection

Letter of introduction was collected from the Head of the Department of Special education, University of Ibadan to principals of the selected schools to seek approval to carry out the research in their schools. Approval was granted. The instruments were administered to the respondents, and prior to the administration of the questionnaires, the researchers explained the purpose of the study to the respondents. They were made to understand that the study was basically for research purpose, the result of which can go a long way in enhancing their on academic performance. Respondents were assured of confidentiality of their responses and the data collection process lasted for the period of two weeks, during which about 100 copies of questionnaire were administered and retrieved.

2.4. Method of Data Analysis

The data collected were analysed using inferential statistics. Multiple regression statistical tool was used to analyse hypothesis one and two. The hypotheses were tested at .05 level of significance.

3. Results

Hypothesis one: There is no significant joint contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun state, Nigeria. This was analysed and the result was presented in Table 1:

Table 1. Multiple Regression Analysis Result of hypothesis One.

Multiple R=.324 Multiple R²=.105 Multiple R² (adjusted)=.086 Standard error of estimate= 1.414					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	22.723	2	11.361	5.680	.005
Residual	194.027	97	2.000		
Total	216.750	99			

Table 1 showed the multiple regression analysis result of significant contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun State, Nigeria. The result showed that ICT and braille literacy yielded a coefficient of multiple correlations (R) of 0.324 and multiple correlations square of 0.105. This shows that about 8.6% (Adj.R²=0.086) of the total variance of academic performance of students with visual impairment in Ogun State, Nigeria was accounted for by the linear combination of the ICT and braille literacy while the

remaining 91.4% could be assigned to other estranged factors not considered in this study. The result in the Table 1 also indicated that ICT and braille literacy had significant joint influence on academic performance of students with visual impairment in Ogun State, Nigeria ($F_{(2,97)} = 5.680$; $p < 0.05$).

Hypothesis two: There is no significant relative contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun state, Nigeria. This was analysed and the result was presented in Table 2:

Table 2. Multiple Regression Analysis Result of Hypothesis Two.

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-3.540	3.537		-1.001	.319
ICT	.097	.035	.268	2.787	.006
Braille literacy	.106	.060	.168	1.748	.044

Table 2 revealed the relative contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun state, Nigeria. The Table also showed that ICT and braille literacy made significant independent contribution to academic performance of students with visual impairment in Ogun state, Nigeria ($\beta = -0.268$, $t = 2.787$, $p < 0.05$; $\beta = 0.168$, $t = 1.748$; $p < 0.05$). This implies that ICT and braille literacy are potent predictors of academic performance of students with visual impairment in Ogun state, Nigeria.

4. Discussion of Findings

The study examined the influence of ICT and braille literacy on academic performance of secondary school students with visual impairment in Ogun State, Nigeria. Hypothesis two predicted no significant joint contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun state, Nigeria. The result of the finding revealed that there was a significant joint contribution of the independent variables (ICT and braille literacy) to academic performance among students with visual impairment in Ogun State, Nigeria. However, previous studies have not delineated the direction of significant joint contribution of ICT and braille literacy on academic performance of secondary school students with visual impairment in Nigeria but present has proven that there was a significant joint contribution of the ICT and braille literacy to academic performance among students with visual impairment.

Hypothesis two predicted no significant relative contribution of ICT and braille literacy to academic performance of students with visual impairment in Ogun state? The result reveals that ICT and braille literacy has a positive contribution and significant to academic performance among

students with visual impairment in Ogun State, Nigeria. This implies that, both factors are potent predictors of academic performance of students with visual impairment, which shows that ICT and braille literacy will bring about high tendency of academic performance among students with visual impairment in Ogun state. This finding corroborates finding of Emechebe [15] who found that poor braille reading ability of students with visual impairment affected their academic achievement.

5. Conclusion

The study investigated the influence of ICT and braille literacy on academic performance of students with visual impairment in Ogun State, Nigeria. However, the research work has established that, there was a positive significant joint contribution of ICT and braille literacy to the academic performance among students with visual impairment in Ogun State, Nigeria. Also, the result revealed that there was a significant relative contribution of ICT and braille literacy to the academic performance among students with visual impairment in Ogun State, Nigeria.

6. Recommendations

The following are recommended that;

Schools should endeavor to equip the library and the resource room with up to date teaching/learning information and communication technology such as victor readers, computers with jaws, adapted maps, adapted mathematical equipments, large print and Braille books to cater for students with visual impairment.

Students with visual impairment should be educated and trained on how to make use of information and

communication technology effectively. This will invariably improve their academic performance.

Government, non-governmental organisations and educational stakeholders should take cognisance of influence of ICT and braille literacy in the development of any intervention to improve academic performance of students with visual impairment.

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