

**Impact and Barriers to Information and Communication Technology
Integration for Inclusive Science Education in Junior Secondary Schools in
Rivers South-East Senatorial District, Nigeria**

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ABSTRACT

This paper investigated the impact and barriers to ICT integration for Inclusive Science Education at the Junior Secondary School Level. The researchers adopted an analytical descriptive survey for the study. It was guided by three research questions and three hypotheses. The population of the study included 95 Public Junior Secondary schools, comprising of 379 science teachers and 261 school administrators (principals and vice principals) in Rivers South-East Senatorial zone in Rivers State, Nigeria. The sample of the study consisted of all 379 science teachers and 261 school administrators; making a total of 640 respondents. The instrument for data collection was a questionnaire titled: Inclusive Science Teaching and ICT Usage Questionnaire. The reliability of the sections of the instrument using Cronbach Alpha were found to be 0.70, 0.69 and 0.81 respectively. This was appropriate for the study. The findings of the study revealed that ICT integration will go a long way in making science education more inclusive at the basic level. It also showed that science teachers are not prepared for integration of ICT for Inclusive Science Education at the upper Basic Level of Education. However, it showed that the barriers to ICT integration for Inclusive Science Education include: unavailability of ICT facilities, erratic electric power supply, inaccessibility to internet services, poor funding, lack of ICT skills among teachers, poor attitude of teachers etc. Based on these, recommendations were made among which were that Basic Schools should be equipped with ICT facilities and science teachers should be trained on the use of ICT facilities and E-learning platforms.

Keywords: Science Education, Inclusive Education, Information and
Communication Technology, Basic Education.

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INTRODUCTION

In the modern world of today, Information and Communication Technology (ICT) have become the order of the day. It cuts across every sphere of life and all aspects of the economy. Hence, it has shaped our way of life and dynamics of the society. In this light, education as an integral sector of the economy is not left out. ICT has made the world a global village, breaking the barriers and linking people and places all around the world. Information Communication Technology (ICT) has brought a paradigm shift in educational systems of the world. It makes knowledge accessible to people by breaking the barriers that pose challenge by preventing persons from gaining access to education. Consequently, learning is no longer limited to the four walls of the classroom. People can now learn anywhere, anytime and at their own pace. The evolving learning environments of today has resulted in two major environments for learning - the physical learning environment and the virtual environment. The physical learning environment has to do with the four walls of the

classroom and this creates a barrier to educational access to certain persons, especially those with disabilities or physically-challenged persons and those who for one reason or the other have to truncate their schooling. On the other hand, virtual learning environment is a flexible learning environment driven by technology; where learners learn at their own pace, without meeting one on one physically with their teachers. Learning is made possible through e-learning platforms, and may be synchronous or asynchronous. To this end, barriers to educational access are completely removed. Amajuoyi (2012) opined that ICTs play a vital role in enhancing the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance educational systems, improve policy formulation and execution, and widen the range of opportunities for business and the poor. Amajuoyi went further to buttress that the poor and many others who live in the poorest countries suffer sense of isolation, but ICT plays a significant role by helping to reduce that sense of isolation and to open access to knowledge in ways that appear inconceivable in recent times.

ICT as perceived by Ibe –Bassey cited in Amajuoyi (2012) is a very important tool for preparing and educating students with the required skills for the global work place. Dike and Arokoyu (2016) hinted that ICT includes the current thinking of ideas using both aural and visual elements methods that allow the skill acquisition, processing and storage of data. Hanza and Mohammed (2012) defined Information and Communication Technology as a variety of technological tools and resources used to communicate and to create, disseminate, store and manage information. These technologies include computers, the internet, broadcasting technologies (radio and television) and telephones. UNESCO cited in Eze (2012) posited that ICT is a term used in describing tools and various processes adopted in accessing, retrieving, storing, presenting and exchanging information by electronic and order automated means. Eze (2012) said it is a way of accessing, storing, sharing, processing, editing, selecting, presenting and communicating information through different electronic media. ICT holds potential benefits in the teaching and learning of science at the basic level. This is why there is need to integrate it into the teaching – learning process as it will enhance access to science education by promoting inclusion in science education. Hanza and Mohammed (2012) asserted that educational systems of various nations of the world have been brought under pressure with regard to using ICTs in educational institutions to inculcate the requisite knowledge and skills into students, which will enable them to survive in today’s dynamic world driven by ICT.

In the light of the foregoing, it is important to note that the traditional educational environments which has to do with mere face to face interaction between teachers and learners without the use of modern technologies pose serious challenge to learners and these affects their preparations for the labour market, where most places of work are laden with many ICT facilities and technological information. Ndirika and Kanu (2012) citing Kashoda et al, stressed that ICT has the potential to promote the quality of teaching and learning, the research productivity of teachers and students and making the management of schools more effective. Sagir et al (2019) pointed out that ICTs have greatly transformed teaching, learning, research and other scholarly and professional activities by improving the process of communication and access to information. They went further to note that ICT has the capacity to help students deal with knowledge in an active, self-directed and constructive way. ICT is

not to be used only as an approach that can be added to conventional methods of teaching but also as an important approach to support new ways of teaching –learning process.

With regard to the role of ICT in optimizing the teaching and learning of science (Basic science and Technology) at the basic level, Nwagbo and Ugwuanyi (2012) succinctly mentioned that Science Education (Basic science and Technology) is more effective with the use of ICT based on the fact that ICT itself originated from Science and Technology. ICT integration in the teaching and learning of science in schools is of paramount value at the basic level because it is obvious that organizations that do not incorporate the new technologies in schools cannot boast of preparing their pupils for life in the twenty-first century (Khalid cited in Nwagbo & Ugwuanyi, 2012). In line with the foregoing, Nwanekezi and Walele (2016) outlined the benefits of ICT integration in education as:

1. ICT helps to make science more interesting, real and applicable to learners/students.
2. It provides more opportunity for perception, talk and investigation for learners.
3. It brings about collaboration and correspondence.

To Dike and Arokoyu (2016), the integration of ICT into science education (chemistry) will:

1. promote the acquisition of basic scientific skills.
2. presentation of new topics in a new and exciting way; using graphics, audio-visual and other varieties of physical resources.
3. provide an individualized platform for learners to learn at their own pace.
4. promote co-operative/collaborative group work.
5. facilitate a holistic learning of concepts.
6. provide a platform for evaluation in which the teacher behaves as a facilitator.

A reflection on the above benefits of integrating ICT into science education reveals that it will make science education more inclusive at the basic level which is the foundation of all the other level of education. To this end, there is need for people to have access to scientific knowledge and skills irrespective of physical condition/or disability, occupation, position, or other reasons that can pose a barrier to their access to scientific knowledge and skills. Hence, ICT remains the instrumentality to achieving this, since science education is of great value at the basic level which remains the foundation of the educational system. In line with this, Nwanekezi and Arokoyu (2016) have submitted that the two major goals of science education are the development of a scientifically literate society and the production of a technological manpower.

The basic level of education is a critical level of education because it is at this level that youngsters are prepared for further studies or educational advancement. With regard to this, there is need to make science education more inclusive at this level of education, through integration of ICT. Basic education in accordance with the Federal Republic of Nigeria (FRN) (2014) is the education given to children between the ages of 0-15 years. It incorporates 1-year of preprimary, 6 years of primary and 3 years of junior secondary education. Amadioha and Akor (2020) maintained that basic education is the most important aspect of education, which is given to people. Moreso, Nwana as cited by Amadioha and Akor (2020) vehemently declared that basic

education is the pivot of the educational system upon which all other educational advancements depend. Against this backdrop, the Federal Republic of Nigeria, (FRN) (2014) has noted that the goals of Basic Education are;

1. To provide the child with diverse basic knowledge and skills for entrepreneurship, wealth generation and educational advancement.
2. To develop patriotic young people equipped to contribute to social development and in the performance of their civic responsibilities.
3. Inculcate values and raise morally upright individuals, capable of independent thinking, and who appreciate dignity of labour.
4. To inspire national consciousness and harmonious co-existence, irrespective of differences in endowment, religion, colour, ethnic and socio-economic background; and
5. Provide opportunities for the child to develop manipulative skills that will enable the child function effectively in the society within the limits of the child's capability.

The above objectives will become plausible if science education is made inclusive at Basic level. The inclusiveness of science education will become realistic; when ICT integration into science teaching and learning is given prominence. Considering the important place ICT occupies in education, FRN (2014) stipulated in section 2, paragraph 28 of her National Policy on Education that government shall provide enough infrastructures and develop capacity for effective utilization of Information Technology (IT) to enhance the delivery of Basic Education in Nigeria. This places ICT in the forefront for advancement of education at the Basic level, which is the most important level of education. This implies that ICT is the instrument that will promote inclusive science education at the basic level, for the actualization of the goals of Basic Education. Worthy of note is the fact that the goals of Basic Education in Nigeria cannot be actualized without effective science education. The goals of science education as stipulated in the National Policy on Education reveals that they are in sync with goals of Basic Education in Nigeria. The goals of science education according to FRN (2014) include:

1. To help learners have the ability to inquire, know and a rational mind for the conduct of a good life and democracy;
2. Produce scientists who will contribute to national development;
3. Service studies in technology and the cause of technological development; and
4. Provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

However, considering the afore-stated goals of science education which aligns with the goals of Basic Education in Nigeria; it has become very imperative to lay emphasis on access to science education, especially at the Basic level which occupies a significant position as the pivot of the entire educational system. Hence, there is need for integration of ICT into the teaching and learning of science at the Basic level in order to promote access to science education which will enable youngster to acquire knowledge and develop skills that will enable them face the challenges of the 21st century; and also prepare them to pursue careers in science and technology. This will go a long way in helping the nation to produce the required manpower that will bring

about national development.

Inclusive Science Education entails that every individual irrespective of physical condition or state, place, position or background etc is given the opportunity or privilege to access scientific knowledge and skills. Many authorities have defined Inclusive education in various ways. Mitler cited in Isah (2010) says that inclusion has to do with a strategy of reforming or restructuring the school system in its entirety, in order to give all children, access to all educational and social opportunities offered by school system. He went further to note that this has to do with the curriculum, recording and reporting of pupils' achievements, the decision that are reached with regard to grouping pupils with schools, and classrooms, teaching methods, and extracurricular activities. Also, Isah (2010) defines inclusive education as a process by which all children in a school regardless of their strengths and weakness in any area of disability become part of the same learning and interactive community. In the view of Allen and Schwartze (2000 cited in Iwuamadi & Obasi, 2016) inclusive education means that all students attend and are given a warm reception by the schools within their areas of residence in the appropriate age into regular classes and are supported to learn, to contribute and participate in all aspects of life of the school. Moreso, United Nation's Education Scientific and Cultural Organization (UNESCO) as observed by Iwuamadi and Obasi (2015), gave a definition which is comprehensive by declaring that inclusive education is a process of modifying or reforming schools and other centers of learning to accommodate all learners including boys and girls, learners from ethnic and linguistic minorities, rural populations, those infected or affected by HIV and AIDS, those with disabilities and difficulties in learning and as well make them have equal opportunities. With regard to the foregoing, inclusive science education is imperative in the contemporary technology –driven society. ICT remains the medium through which young people can have access to science education in terms of basic scientific knowledge and skills in order to become scientifically literate and to the capability to survive in the society, irrespective of their physical state/condition; inequality in endowment, socio-economic background, and other reasons that may have hampered their education. ICT brings people together in order for them to be on the same page, thus creating avenue for exchange of ideas through collaborative learning via virtual technology.

Notwithstanding the enormous benefits of ICT integration in science education, it is very lamentable that it remains a mirage in the Nigeria educational system. This is because a lot of barriers have continued to hinder the full integration of ICT in Nigerian education system for inclusive science education. In line with this, Avwiri in Obafemi and Avwiri (2016), noted that one of the barriers to effective integration of ICT into the teaching and learning of science is the unavailability of computer and most ICT facilities that could help improve teaching and learning in schools. In a study by Sagir et al (2019) on factors militating against the use of ICT in teaching and learning in Kebbi State, Nigeria, involving 503 secondary school students, a questionnaire was used to collect data; and data collected was analyzed by using frequency counts and simple percentage to answer the two research questions that guided the study. They found out that the factors militating against ICT integration for teaching and learning include: lack of qualified teachers, lack of internet facilities, and unavailability of well-equipped computer laboratory for

practical. Additionally, Egwu and Chidi –Ehiem (2014) opined that the language of ICT, lack of relevant software, inadequate power supply, ICT illiteracy and lack of time to use ICT in teaching and learning are the challenges to use of ICT in teaching and learning. In this light, Amajuoyi (2012) submitted that the challenges/barriers to integrating ICT in education include: lack of infrastructure, human resources capacity shortage, financing the use of ICT and large class, while Hamza and Mohammed (2012), identified the barriers to ICT integration in teaching and learning at the basic level as: lack of qualified teachers who are ICT literate and capable of operating the modern facilities, lack of modern ICT facilities like computers in public schools, poor funding, erratic and unreliable power supply, high level of poverty and low level of literacy among Nigerians which hinder the possession of Modern ICT components like computers, internet services, television etc by parents for their children’s use. Also, Etiubon and Etiubon (2012) submitted that the problems militating against the implementation of ICT utilization in UBE include: inadequate and unskilled ICT basic science teachers, inability of teachers to meaningfully interpret the performance objectives of ICT guidelines and software, inadequate provision of infrastructure such as buildings, maintenance and repairs workshops for ICT programmes and accessories, inadequate communication skills to effectively use ICT resources on e-learning information services for simulation on ICT devices.

Statement of the Problem

The normal school setting poses a barrier to some learners, especially in the learning of science. This may be as a result of the learners having long term physical, mental, intellectual, psychological, physiological impairments and learning difficulty, which constitute barriers to their effective classroom’s interactions and participation on equal basis with other learners. This ‘perceived disadvantaged’ group also include those with learning disabilities, physically challenged, those who for one reason or the other had to drop out of school, those affected by their socio-economic background (the almajiris, the nomadic cattle-rearers, migrant fishermen/women’s children), as well as those living with HIV/AIDS, etc. This group of learners may not have equal learning opportunity with other students on the ground of their disabilities. In the light of this, it becomes difficult for them to acquire scientific knowledge that will make them scientifically literate and develop skills for survival, especially in this contemporary society. It has become very imperative in this contemporary technology –driven society to ensure that these disadvantaged children and the normal children, learn in the same classroom or in the same platform. Hence, the need for ICT integration in science education at the basic level. The use of ICT could promote effective teaching and learning of science at all levels of education; and give students opportunity to interact with each other without barrier; as well as aid self-paced learning. However, ICT integration in Nigeria education system is but a mirage. Studies have shown that ICT integration at the basic level of education is fraught with various challenges amongst which are poor funding, lack of ICT facilities as well as lack of ICT and 21st century skills among teachers, especially science teachers. Against this background, this study investigated ICT integration for inclusive science education at the basic level in Rivers State, with regard to the extent to which ICT will promote inclusiveness of science education at the basic level and the barriers to effective ICT integration.

Aim and Objectives of the Study

The major aim of this study is to assess ICT integration for inclusive science education at the Junior secondary level with regard to the barriers to effective integration for inclusion in science education at the basic level in Rivers South East Senatorial zone of Rivers State, Nigeria. Specifically, the objectives of the study include:

1. To determine the extent to which ICT integration could make science education more inclusive at the Junior secondary level.
2. To assess teachers' preparedness for the integration of ICT for inclusive science education of the Junior secondary level.
3. To ascertain the barriers to ICT integration for inclusive science education at Junior secondary level.

Research Questions

The following questions were posed to guide the study:

1. To what extent will ICT integration make science education classrooms more inclusive at the Junior secondary level?
2. What is the level of science teachers' preparedness for ICT integration for inclusive science education at the Junior secondary level?
3. What are the barriers to ICT integration for inclusive science education at the Junior secondary level?

Hypotheses

1. There is no statistically significant difference in the mean ratings of science teachers and school administrators on the extent to which ICT could make science education more inclusive at the Junior secondary level.
2. There is no statistically significant difference in the mean ratings of science teachers and school administrators on the level of preparedness of science teachers for ICT integration for inclusive science education at the Junior secondary level.
3. There is no statistically significant difference in the mean ratings of science teachers and school administrators on the barriers to ICT integration for inclusive science education at the Junior secondary level.

METHODOLOGY

The study was an analytical descriptive survey which was carried out in Rivers South East Senatorial zone of Rivers State. The senatorial zone is made up of seven local government areas which are: Khana, Gokana, Oyigbo, Tai, Eleme, Andoni and Opobo/Nkoro Local Government Area of Rivers State. The population of the study consisted of 379 science teachers and 261 school administrators (principals and vice principals in the 95 Upper Basic schools (Junior Secondary Schools) in the senatorial zone making a total of 640 respondents. The sample of the study was 640 respondents which consisted of 379 science teachers and 261 school administrators (principals and vice principals). Sampling was by census because of the manageable size of the population.

The instrument for data collection was the researchers' – made questionnaire known as Inclusive Science Teaching and ICT Usage Questionnaire (ISTIUQ) with four-point response types of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE) to answer Research Question one and Well

Prepared (WP), Fairly Prepared (FP), Poorly Prepared (PP), and Not Prepared (NP) for Research Question two. ISTIUQ was validated by two experts in Science education of the Rivers State University and Ignatius Ajuru University of Education; as well as two experts in Research, measurement and evaluation of the University of Port Harcourt and Ignatius Ajuru University of Education. A pilot study was carried out to determine the reliability of ISTIUQ using 45 private school teachers in the senatorial zone. The reliability coefficients using the Cronbach Alpha for the three sections of the instrument were 0.70, 0.69, and 0.81 respectively. The instrument was therefore deemed appropriate for the study. ISTIUQ was administered to the respondents by the researchers and with the help of some teachers in the senatorial zone who worked as research assistants. The data collected were presented in tables. The research questions were answered with means and standard deviations while the null hypotheses were tested with z- test at 0.05 level of significance.

A criterion reference mean of 2.50 and above was accepted for High Extent, while any value below 2.50 was Low Extent for Research Question one. Similarly, A Mean value of 2.5 and above shows that teachers are prepared (P), while below 2.5 shows that teachers are not prepared (NP) for Research Question two.

RESULTS

Research Questions 1

To what extent will ICT integration make science education classrooms more inclusive at the basic level?

Table 1

Extent to which ICT will make Science Education Classrooms more Inclusive at Basic Level

S/N	Item	VHE	HE	\bar{X}	LE	VLE	\bar{X}	SD	Decision
1.	make science more interesting, real and applicable to learners	2.9	2.3	2.6	1.8	1.0	1.4	2.3	HE
2.	Provide variety of learning resources	3.6	2.0	2.8	1.3	1.1	1.2	2.8	HE
3.	Make for immediacy of information	2.2	2.8	2.5	1.4	1.6	1.5	3.8	HE
4.	Aid learning anytime and anywhere	3.1	2.3	2.7	1.8	0.8	1.3	2.8	HE
5.	Promote collaborative learning	3.2	2.6	2.9	1.4	0.8	1.1	2.6	HE
6.	Promote distance learning	3.6	1.8	2.7	1.1	1.5	1.3	3.2	HE
7.	Support individualized instruction	2.7	2.5	2.6	1.5	1.3	1.4	3.1	HE
8.	Provide up to date information and access to e-libraries	2.8	2.8	2.8	0.9	1.5	1.2	3.0	HE
9.	Support holistic learning of science	3.6	1.6	2.6	1.0	1.8	1.4	2.7	HE
10.	Provide platform for evaluation for the teacher	2.9	2.7	2.8	1.7	0.7	1.2	2.3	HE

Table 1 shows that ICT integration will make science education inclusive, as perceived by the respondents.

Research Questions 2

What is the level of science teachers' preparedness for ICT integration for inclusive science education?

Table 2

Science Teachers' preparedness for ICT integration for Inclusive Science Education

S/N	Items	WP	FP	\bar{X}	PP	NP	\bar{X}	SD	Decision
1.	Teachers have obtained ICT skills for handling of digital devices for effective teaching of science.	1.9	0.5	1.2	2.6	3.0	2.8	2.6	NP
2.	Teachers are digitally literate and can make use of virtual platforms	1.7	0.9	1.3	2.8	2.6	2.7	2.8	NP
3.	Teachers have been trained in the use of digital tools and virtual/e-learning platforms	1.2	1.6	1.4	2.5	2.7	2.6	3.4	NP
4.	Teachers have digital/ICT skills and own laptop and other smart devices	1.4	0.8	1.1	3.0	2.8	2.9	2.8	NP
5.	Teachers have the capacity to plan and present science instructions in virtual/e-learning platforms	1.0	1.8	1.4	2.9	2.3	2.6	3.4	NP
6.	Teachers encourage students to be digitally literate and to partake actively in class virtual	1.4	1.0	1.2	3.0	2.6	2.8	3.1	NP
7.	Teachers make use of multi-media approaches in teaching science	2.6	2.0	2.3	2.4	3.0	2.7	2.9	NP
8.	Teachers are aware of blended methods of teaching like flipped classroom and integrate this in the classrooms	0.8	1.0	0.9	3.2	3.0	3.1	3.2	NP

The result as shown in Table 2 revealed that science teachers are not yet prepared for ICT integration for inclusive science education at the Junior secondary level.

Research Question 3

What are the barriers to ICT integration for inclusive science education at the upper basic level?

Table 3

Checklist of Barriers to ICT integration for Inclusive Science Education at the upper Basic Level

S/N	Perceived Barriers	% Responses		Decision
		Barrier	Not barrier	
1.	Unavailability of ICT facilities like computers, projectors, TVs, DVD and VCD players, etc.	640 (100%)	0 (0%)	Barrier
2.	Lack of Internet facilities	640 (100%)	0 (0%)	Barrier
3.	Erratic power supply	640 (100%)	0 (0%)	Barrier
4.	Inadequate funding of schools	640 (100%)	0 (0%)	Barrier
5.	Lack of ICT skills amongst science teachers	520(81.3%)	120 (18.8%)	Barrier
6.	Inadequate manpower in schools	640 (100%)	0 (0%)	Barrier
7.	Poor motivation of science teachers	640 (100%)	0 (0%)	Barrier
8.	Poverty and illiteracy among parents	286(44.7%)	354 (55.3%)	Not barrier
9.	Lack of computer/ICT laboratories	611 (95.5%)	29 (4.5%)	Barrier
10.	Poor study habit of students	167 (26.1%)	473 (73.9%)	Not barrier
11.	Poor attitude of parents	82 (12.8%)	558 (87.2%)	Barrier
12.	Poor policy implementation	615 (96.1%)	25 (3.9%)	Barrier

With regard to Table 3, all 640 (100%) respondents agreed that Unavailability of ICT facilities, Lack of Internet facilities, Erratic power supply, Inadequate funding of schools, Inadequate manpower in schools, and Poor motivation of science teachers are barriers to ICT integration for inclusive science education; 520 (81.3%) respondents agreed that Lack of ICT skills amongst science teachers is a barrier to ICT integration; 611 (95.5%) persons agreed that Lack of computer/ICT laboratories is a barrier; 615 (96.1%) respondents agreed that Poor policy implementation is a barrier to ICT integration. On the other hand, 354 (55.3%) persons alluded to the fact that Poverty and illiteracy among parents is not a barrier; 473 (73.9%) respondents accepted that Poor study habit of students is not a barrier; also, 558 (87.2%) respondents agreed that Poor attitude of parents is not a barrier to ICT integration for inclusive science education at the Junior secondary level of education.

Hypothesis 1

There is no statistically significant difference in the mean ratings of science teachers and school administrators on the extent to which ICT could make science education more inclusive at the Junior secondary level.

Table 4

Z-Test Analysis on Extent of Inclusiveness of science education with ICT integration

Group	\bar{X}	SD	N	df	Z_{cal}	Z_{crit}	Decision
Science Teachers	3.10	0.79	379	638	0.11	1.96	Accepted
School Administrators	2.98	0.80	261				

Table 4 shows that the calculated z value (0.11) is less than then critical value of z from tables ($Z_{crit} = 1.96$) at 0.05 level of significance and 638 degrees of freedom. Hence, the null hypothesis of no significant difference was accepted. This indicated that the science teachers and school administrators agreed that ICT will make science education more inclusive at the basic level.

Hypothesis 2

There is no statistically significant difference in the mean ratings of science teachers and school administrators on the level of the preparedness of science teachers for ICT integration for inclusive science education at the Junior secondary level.

Table 5

Z-test Analysis on Level of Science Teachers' Preparedness for ICT Integration for Inclusive Science Education.

Group	\bar{X}	SD	N	df	Z_{cal}	Z_{crit}	Decision
Science Teachers	2.04	0.75	379	638	0.51	1.96	Accepted
School Administrators	2.01	0.71	261				

Table 5 showed that the calculate z-value ($Z_{cal} = 0.51$) is less than the critical value ($Z_{crit} = 1.96$) at 0.05 level of significance and 638 degrees of freedom. Based on this, the null hypothesis of no significant difference was accepted. This means that the science teachers and school administrators agreed that the science teachers are not yet prepared for ICT integration for inclusive science education at the Junior secondary level.

Hypothesis 3

There is no statistically significant difference in the mean ratings of science teachers and school administrators on barriers to ICT integration for inclusive science education at the Junior secondary level.

Table 6

Z-Test Analysis on the Barriers to ICT Integration for Inclusive Science Education at the Basic Level

Group	\bar{X}	SD	N	df	Z_{cal}	Z_{crit}	Decision
Science Teachers	2.80	0.89	379	638	0.11	1.96	Accepted
School Administrators	2.70	0.75	261				

From Table 6, it is obvious that calculated value of z ($Z_{cal} = 0.11$) is less than the critical value of 1.96 at 0.05 level of significance and 638 degrees of freedom. Hence, the null hypothesis of no significant difference was accepted. This implies that the science teachers and school administrators agreed that the items in Table 3 are the barriers to ICT integration for inclusive science education at the Junior secondary level.

DISCUSSION OF FINDINGS

The findings from the study show that both science teachers and school administrators agreed that the use of Information and Communication Technology in the classroom will make science education more inclusive at the Basic level of education. This is because it will provide opportunity for persons to acquire scientific knowledge and skills to become scientifically literate in technology-driven world, irrespective of their physical state, socio-economic status or background, location etc. The finding was in line with Amajuoyi (2012) who submitted that ICT plays a significant role in helping to reduce the sense of isolation felt by the poor and others who live in poorest countries and opens access to knowledge in ways that appear inconceivable in recent times. Also, in this light, Amajuoyi documented that ICT provides developing countries beautiful opportunities to enhance their educational systems, improve policy formulation and execution.

The findings of the study with regard to teachers’ preparedness for ICT integration for inclusive science education show that science teachers are not yet prepared for ICT integration for inclusive science education at the basic level. This is because most of the science teachers are not digitally literate; they lack ICT skills which will enable them to handle digital tools, most of them cannot plan and presents science instruction in virtual/e-learning platforms. This finding agrees with Egwu and Chidi-Ehiem (2014) who identified ICT illiteracy as one of the major problems affecting ICT integration in teaching and learning.

With regard to barriers to ICT integration for inclusive science education, findings from the study indicated that the barriers to ICT integration include: Unavailability of ICT labs and ICT facilities, lack of internet facilities, erratic electric power supply, poor funding, lack of ICT skills among science teachers, lack of qualified science teachers, poor attitude to ICT among teachers, as well as poverty and illiteracy among parents. These findings corroborate the findings of Mohammed (2019) who discovered that the factors militating against ICT integration in teaching and learning include: lack of qualified teachers, lack of internet facilities and

unavailability of well-equipped computer laboratory for practical. In the same vein, it supports Amajuoyi (2012), Chidi-Ehiem (2014), Hamza and Mohammed (2012) who identified the barriers to ICT integration for education as: language of ICT, lack of modern facilities, inadequate power supply, poor funding, lack of relevant software, lack of time to use ICT, large class, ICT illiteracy, as well as poverty and low level of literacy among Nigerians etc.

CONCLUSION

In these contemporary times, every facet of life is driven by technology. ICT has brought about the accessibility to information, linking people and places, and making the world a global community. It has become very imperative for Nigeria as a developing country to key in and make science education more inclusive by implementing the use of digital technology or ICT facilities in teaching and learning at the Basic level, in order to bring about opportunity for young person's to acquire scientific knowledge and develop skills that will make them scientifically literate, so that they can make decisions that will affect their lives positively, develop survival strategies and to contribute to the development of the nations, irrespective of their gender, socio-economic background, position or location, health status, physical and psychological state. However, the study has revealed that ICT will make science education more inclusive at the Basic level of education. It also showed that there are serious barriers to ICT integration for inclusive science education at the Basic level.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations have been made:

1. Government, private sector, Parent Teacher Associations and Non-Governmental Organizations should pull resources together to equip schools with ICT laboratory and facilities for inclusive science education at upper Basic level.
2. Science teachers should be trained on the use of ICT facilities in teaching and learning of science at the basic level as well how to plan and present science instruction in virtual or E-learning platforms.
3. ICT integration for science teaching/learning should be enforced at the Basic level of education, in order to promote inclusive science education.

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