

# The Use of Ict as an Integral Teaching and Learning Tool for Children with Autism: A Challenge for Nigeria Education System

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## Abstract

The study focused on integrating information and communication technology (ICT) as an integral delivery tool for children with autism for a productive life in the society. A survey design was adopted with two research questions. One hundred and eight (108) primary school teachers were selected for the study through a purposive random sampling technique. A 34-item questionnaire was used for data collection which was face validated by three experts and its reliability coefficient was 0.82 using Cronbach alpha method. The data collected were analysed using mean and standard deviation. The results showed that teachers were clearly aware of most of the assistive technology tools as delivery tools that could be used for teaching children with autism. Again the teachers adopt instructional strategies for using assistive technology averagely to a great extent. It was recommended that assistive technology tools should be made available to the teachers in schools by the government and stakeholders, to help children with autism to maximize their potentials.

**Keywords:** ICT, Autism and Educational challenges

## Introduction

The role of technology in teaching and learning is becoming a topic of discussion in educational system in contemporary Nigeria. A fundamental change is taking place in our educational system as the application of technology in all spheres of human endeavours is permeating the education system. The innovation that information and communication technology (ICT) has brought into education has made tremendous changes to the lives of people in the society, including individuals with disabilities. Thus, the use of ICT to acquire knowledge and skill has become an essential element in education and training, and these ICT elements in the educational process have good effects if properly applied. The clarion call in recent times to integrate ICT in the education program will be of great value to meet the millennium development goals (MDG). It is a vital tool for providing effective instruction in the classroom and solving communication problems, while its applications are making dramatic changes in the economic and social developments of the society. According to the G-8 Nations' Forum (2000), ICT has proved to be a very powerful tool in educational reform.

Education is a means and process of bringing about change in specific and desired directions. Special education is an education within the general education, designed not only to prevent, reduce or eliminate all conditions which produce significant defects in all round functioning of persons with impairment but also designed to render specialized services directed towards meeting the learning potentials of persons with special needs (Okeke-Oti, 2010). In Nigeria, special education programs seem to still be adopting the old fashioned Braille machines, typewriters, conventional teaching methods, chalkboards among others in teaching and learning. Adedokun (2010) noted that learners of this nature hardly come out of schools to be of any productive relevance to themselves and the society. Information from developed countries shows that children with special needs even in regular inclusive settings are equipped with ICT facilities for teaching and learning. The ICT facilities are designed to serve as personal tutors, with captivating interest and capable of arresting the learners' attention irrespective of the disability. Based on this background, there is need to integrate and embrace ICT into special education programs in the regular schools so that children with special needs would become productive citizens.

## Concept of Information and Communication Technology (ICT)

ICT is described as the devices and principles involved in information processing, as well as electronic communication which includes all the hardware and software needed for processing in teaching and learning (New World Bank Report, 2006). Roongta in Etonyeaku (2009) described ICT as all the forms of technology used to transmit, store, create, share or exchange information. In a broader sense, ICT includes such technologies like radio, television, video, telephone, satellite systems, computers, network, hardware and software. ICT is a combination of network of software and hardware as well as a convergence of information, communication and technology (Etonyeaku, 2009). They are technological tools and resources used to communicate, create, organize, disseminate, store, retrieve and manage information and learning (Obi, 2002).

Integrating ICT into special needs education would be an instrument per excellence for reducing handicapping challenges in our society. A good number of researches have shown that learning can be significantly enhanced when ICT is approached and utilized as an intellectual multi- tool ( Onu, 2006).

Technology application at primary school level is very critical. Ofoegbu (2008) in a research on primary school pupils and acquisition of ICT skills discovered that from primary one a child is already disposed for the use of ICT. The proficiency increases with age if the child is placed in a favourable environment. Given the constant flux in technology, there is need to redesign ICT curricula in the public schools system to stress certain computer concepts and knowledge, so as to make children with disability more productive in their community when they leave school. Technology occupies a special place in the education of children with autism. They may not want human contact and may prefer to interact with inanimate objects such as computers, video machines, etc. Technology enhances communication and learning which addresses some of the deficits that autistic children have. ICT can provide access to information source, create interacting learning environment, they can enable communication and promote changes in methods of teaching these exceptional students.

### **Concept of Autism**

Autism disorder is a complex developmental brain disorder, which, typically appears during the early years of a child's life, affecting his or her social skills and interactions. Behaviourally, there is usually difficulty with the individual responding to people, events and objects. Responses to sensations of light, sound and feelings may be exaggerated and delayed and language skills may be demonstrated. The difficulties are usually observed before two and half years (Tuchman, 2004) or even earlier as observed with some children. According to the Autism Society of USA (2010), autism is a complex developmental disability that typically appears during the first two years of life and is the result of a neurological disorder that affects the functioning of the brain, impeding development in the areas of social interaction and communication skills. Both children and adults on the autism spectrum typically show difficulties in verbal and non-verbal communication, social interactions, sensory development, cognition and leisure or play activities. The developmental disorder, adversely affects the educational performance of the child, (IDEA, 2010; Sabine Vaccine Institute, 2006).

Furthermore, autism is defined as a spectrum disorder varying in severity and impact from individual to individual ranging from those with no speech to people with intelligence quotient (IQ) in the average range who are able to hold down a job or start a family (Knapp, Romeo and Beecham, 2009; Autism Society of America, 2010). The authors also explained that two children both with the same diagnosis can act completely different from one another and have varying capabilities (that is, high and low functioning autism). In a study, Green (2002) found out that autism occurs in 15 out of every 10,000 individuals, and it is four times more prevalent in boys than girls and knows no racial, ethnic or cultural boundaries.

Majority of autistic children have intelligence quotient of less than 70 (Gillberg, 1998). Though, level of intelligence is not a defining feature of autism, but cognition is an important variable. There is experimental evidence that suggests that children with autism have a central cognitive deficit affecting their perception of the world. They have an impairment to see things from another point of view and that they have little awareness of the mental states of other people. Some of the characteristics of autistic children presuppose that when they are taught with ICT they will learn and become more skillful and productive. For example, they have certain attachment to objects and fascination with parts and movement of objects. They also treat people as objects.

Different modes of technology have been used to improve the quality of life of people who have various developmental disabilities. Assistive technology is now being used for children with autism (Stokes, 2010). This means any item, piece of equipment or product system, whether acquired commercially, off-shelf, modified or customized, that is used to increase, maintain, or improve functional capabilities of individual with disabilities (Technology Related Assistance for individuals with Disabilities Act, 1988). The services provided by assistive technology directly assist individuals with disability in the selection and acquisition of or use of an assistive technological device. Various types of technology from "low" technology to "high" technology should be incorporated into every aspect of daily living in order to improve the functional capabilities of children with autism. As noted earlier, children with autism process visual information easier than auditory information. As such, when assistive technology is used for them, teachers will be giving them information through their strongest processing area which is visual.

It is important to determine which visual representation system is best understood by the child and in what context. Examples of visual systems that can be used include real objects, photographs, realistic drawings, line drawings and written words. These can be used with assorted modes of technology as long as the child can understand and readily comprehend the visual representation. Visual representation systems can be used in different situations. A lot depend on numerous factors such as the skill being taught, as well as the unique characteristics of autism.

The technological strategies involve “low”, “mid” and “medium” technologies (Stokes, 2010). The first is a visual support strategy which does not involve any type of electronic or battery operated device. It is low cost and easy to use equipment. Examples include-dry erase boards, clipboards, 3-ring binders, manila file folders, photo albums, laminated pictures/ photographs and highlight tapes. The second which is mid technology is a battery operated devices that require limited advances in technology. Examples include tape recorders, language master, overhead projector, timer, calculators, and simple voice output devices. The third one which is medium is a complex technological support strategy which includes video cameras, computer, adaptive hardware and complex voice output devices.

Research has shown that computers are great assistive technological tools (Cutter, 2010) because children with autism are motivated by predictability and consistency. They put the child in the driver’s seat and facilitate learning and independent functioning. Children with autism who use computers have increased attention span, can stay in their seats longer, develop improved fine motor skills and show greater ability to generate skills across various environments such as repeating a wanted behaviour at home that was learnt at school. Adaptive hardware for computer use has also been instrumental in reducing excessive behaviours such as agitation, perseveration and self stimulating behaviours.

### **Strategies for Integrating ICT into Educational Programs for Children with Autism**

Appropriate integration of ICT allows students to access and analyse effectively a wider range and a greater quantity of information in more media than ever before. ICT encourages students to reflect on their perceptions of time and space. They interact with one another and with the world beyond their schools in new ways that improve learning and sustain their achievement. Children with autism process visual information easier than auditory information. Various types of technology from the “low” technology to the “high” technology should be incorporated into every aspect of their daily living in order to improve their functional capabilities (Cutter, 2010).

As noted earlier, visual representation of real objects is an effective strategy for children with autism. It depends on some factors such as the skill being taught and the peculiar characteristics of that autistic child. It is best to start with a visual representation system of line drawings and move to a more concrete representation system of photographs or objects needed. The teacher can make use of Picture Communication Symbols (PCS) by Mayer-Johnson. These could be achieved through the use of photographs. Stokes (2010) advised that when using line drawings as in Board maker, care should be taken to determine whether to use black, white or other colours in picture communication symbols as some autistic children may prefer or dislike specific colours. They may focus on the colour instead of processing the entire picture.

When any visual representation system is to be used, it should be combined with a written word, as some autistic children show a high interest in letters and words. As some are early readers, it is important to enhance the child’s literacy skills by providing the written word with any type of visual representation system. In other words, make use of objects, photographs, realistic drawings, line drawings and written words (Trehin, 2010).

Computers are the perfect assistive technology tools for teaching autistic children (Cutter, 2010). It is important to use a standard computer for the child. The components include touch screen, keyboard, foot-mouse and an ergonomic trackball, among others. By considering the specific needs of children with autism and with the use of appropriate computer techniques, to meet their needs, important assistance shall be given to their cognitive and social development.

Autism is a developmental disability which manifests behaviourally among children, yet some teachers have been teaching autistic children as other children without success. Some teachers are ignorant of the disability state of these children. They had been using corporal punishment to reform the behaviour to no avail (Cutter, 2010). With successful research on the use of ICT in teaching and learning and with autistic children being neglected in the Nigerian school system, there is need, to integrate ICT in the school system to maximize their learning potentials.

Various types of technologies have been used to improve the quality of life of the people who have developmental disabilities. However, the varied use of technology for children with autism continues to receive limited attention, despite the fact that technology is of high interest for many of these children. This is a big challenge to classroom teachers in developed and developing nations who provide instructions to exceptional students. Hence the problem of this study was to ascertain the primary school teachers’ level of awareness of assistive technology and the extent to which the teachers adopt the various strategies for using assistive technology. There is need to integrate ICT in the curriculum to assist these children in the classroom.

### **Purpose of the Study**

The main purpose of this study was to determine ICT as an integral teaching and learning tool for

children with autism. Specifically, the study determined:

1. the primary school teachers' awareness of the different assistive technology tools that would be used to train children with autism and maximize their potentials;
2. the extent the primary school teachers adopt the various strategies for using assistive technology tools in the classroom.

### Research Questions

The study was guided by two research questions based on the specific purpose highlighted above:

1. What is the primary school teachers' level of awareness of assistive technology tools that should be used by teachers on children with autism to maximize their potentials?
2. To what extent do primary school teachers adopt the various strategies for using assistive technology tool in the classroom?

### Methodology

The design of the study was descriptive research survey, because the intent was to elicit information from the respondents. Osuala (2004) stated that when a survey centres on individuals and their opinions, beliefs, motivation and behaviours, the survey method is most appropriate.

The study was carried out in Nsukka Education Zone of Enugu State of Nigeria and the participants comprised of all the teachers in primary schools in the zone. The sample for the study consisted of 108 teachers in primary four, five and six. Three schools were purposively selected each from the three local government areas of the education zone. A purposive random sampling technique was used to select twelve teachers in primary four, five, and six for each school. The presence of autistic children is a criterion for selecting schools and classes.

The instrument for data collection was a 34-item structured questionnaire, named Assistive Technology Tools for Children with Autism (ATCA). The instrument was developed by the researchers from the extended review of literature and based on the researchers' experience in the field of special education, vocational guidance education and educational technology. The instrument was subjected to face validation by three experts from special education, vocational education and educational technology, for facts, clarity, relevance and content validity. The internal consistency of the instrument was determined using test retest with the use of Cronbach alpha method which yielded a coefficient of 0.82 showing that the instrument was reliable for the study.

The instrument consisted of two parts: the first part was on the level of primary school teachers' awareness of the different assistive technology tools that would be used to train children with autism and maximize their potentials. The instrument was structured on a four point modified rating scale of highly aware (4 points) fairly aware (3 points) little aware (2 points) and not aware (1 point) while part two was on the extent the primary school teachers adopt the various strategies for using assistive technology tools in the classroom. Part also has a four point modified rating scale of very great extent VGE (4 points) great extent GE (3 points), little extent, LE (2 points) and very low extent, VLE (1 point).

The questionnaires were administered to the respondents by the researchers with the help of three research assistants. An-on-the-spot collection was made to ensure a high return, and there was 100% return rate.

Data obtained were collated and analysed using mean and standard deviation to answer the research questions. The standard deviation of each item was used to find out how far the respondents deviated from one another in their opinions. The limit of real numbers was used to interpret the means as follows: for research question one: 0 to 1 = not aware, 1.1 to 2 = little aware, 2.1 to 3 =fairly aware, 3.1 to 4 = highly aware. For research question two: 0 to 1 = Very low extent, 1.1 to 2 =Low extent, 2.2 to 3 = High extent, 3.3 to 4 =Very extent.

### Results

The results are presented in tables according to the research questions.

**Research Question 1:** What is the primary school teachers' level of awareness of assistive technology tools that should be used by teachers on children with autism to maximize their potentials?

**Table 1:** Mean ratings of the primary school teachers' level of awareness of assistive technology tools that should be used by teachers on children with autism to maximize their potentials?

N = 108

S/N	Item Statement	Mean	SD	Remarks
1.	Visual representation system	2.76	1.08	Fairly aware
2.	Objects	2.82	1.04	Fairly aware
3.	Real objects	2.45	2.22	Fairly aware
4.	Photographs	2.90	1.12	Fairly aware
5.	Line drawing	2.55	1.08	Fairly aware
6.	Board maker	2.96	1.04	Fairly aware
7.	Picture communication symbol	2.36	1.09	Fairly aware
8.	True object based Icons	2.30	1.62	Fairly aware
9.	Tape recorders	3.00	0.83	Highly aware
10.	Voice output Communication Aids	3.09	0.98	Highly aware
11.	Adaptive hardware for computer use	2.75	1.06	Fairly aware
12.	Touch screen	3.20	0.79	Highly aware
13.	Intellikeys keyboard	3.41	0.72	Highly aware
14.	Big keys keyboard	2.85	1.03	Fairly aware
15.	Big keys plus keyboard	2.75	1.05	Fairly aware
16.	Foot mouse	2.55	1.12	Fairly aware
17.	Ergonomic trackball	2.64	1.01	Fairly aware
18.	Fore warming cards	2.45	1.20	Fairly aware
19.	Picture exchange communication system	3.42	1.09	Highly aware

Table 1 shows teachers' Mean responses. Items 9, 10, 12, 13 and 19 indicate that the teachers are highly aware while items 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 15, 16, 17, and 18 indicate that the teachers are fairly aware of such technologies for teaching children with autism.

**Research Question 2:** To what extent do primary school teachers adopt the various strategies for using assistive technology tools in the classroom?

**Table 2:** Mean ratings of the respondents' on the extent they adopt the various strategies for using assistive technology tools in the classroom?

N = 108

S/N	Item Statement	Mean	SD	Remarks
20.	Pointing systems using drawings or symbols	3.40	0.92	Very Great Extent
21.	Use of communication cards	3.41	0.72	Very Great Extent
22.	Combining the principle of card communication with the possibilities provided by computer	3.42	1.09	Very Great Extent
23.	Voice synthesis which enables easier communication with an interlocutor	3.00	0.99	Great Extent
24.	System of unfolding pictures	2.80	1.11	Great Extent
25.	Communication using a computer keyboard	3.47	0.81	Very Great extent
26.	Reception using a visual document displayed on a computer screen or print up	2.64	1.01	Great extent
27.	Use of internet	2.50	1.21	Great extent
28.	Games for learning social skills	2.54	1.20	Great extent
29.	Computer simulation in a known environment to learn basic rules	2.80	1.11	Great extent
30.	Computer aided programs for artistic creation	3.47	0.81	Very Great extent
31.	Word processing programs to enable errors be corrected (spelling mistake)	3.40	0.90	Very Great extent
32.	Computer-aided graphics programs to allow the "painter" go back over the drawing	2.64	1.01	Great extent
33.	Computer-aided graphics to help a person tell a story with the use of text or with the help of drawings or both	3.58	0.82	Very Great extent
34.	Computer-aided graphics for musical creation	2.85	1.03	Great extent

Table 2 shows teachers Mean responses. The data in Table 2 revealed that all the items had their Mean value ranged from 2.50 – 3.58 which are within the range of very great extent and great extent. This showed that all the items were database strategies, and that teachers use all of them to implement the technology.

## Discussion of Results

The procedure adopted in the discussion of result was guided by the research questions of the study and presented as follows:

Following research question 1, Table 1, the findings of the study showed that out of the 19 items, teachers were highly aware of 5 as assistive technology that could be used for children with autism, while they were fairly aware of 14. These assistive technology tools include visual representation systems, objects, real objects, photographs, board maker, tape recorder, voice output aids, adaptive hardware, touch screen, intellikeys, big keys, foot mouse ergonomic trackball, fore warming cards and picture exchange communication system. This is in line with the study of Ayannuga (2009), Stokes (2010) and Cutter (2010) that children with autism can now make use of assistive technologies such as touch screen, tape recorders, real objects and keyboards among others. This will enable them to communicate effectively, leading to subsequent change in behaviour from social skills that would be learnt.

Based on research question 2, Table 2 revealed that, 15 strategies needed for the implementation of assistive technology for children with autism were investigated. The findings in Table 2 showed that primary school teachers to a very great extent adopt strategies 20, 21, 22, 25, 30 and 31, as instructional strategies. Again, they adopt items 23, 24, 26, 27, 28, 29, 32, 33 and 34 to a great extent. This is in agreement with the findings of Orukokan, Olaleye and Odumosu (2009) that ICT has become an indispensable asset for teachers and learners and have become the latest lessons delivery method that can assist students to acquire knowledge in various subjects with little or no efforts. The use of Internet teaching aids are still lacking in some schools as indicated by respondents. Games for learning social skills are yet to be reflected in the teaching of most subjects in the schools. When these are entrenched in the curriculum, the pupils will benefit tremendously in the school system. Their behaviours will change and they can communicate with fellow pupils, teachers and parents. The learning will be meaningful and the efficient use of assistive technologies also brings increase in achievements of children with autism because it makes learning real and reduces abstractions.

## Conclusions

From the study, it has been found out that teachers are clearly aware of the assistive technology devices and related instructional methods that could be used for children with autism. In addition, information and communication technology has become an indispensable asset for teachers and learners. Thus, assistive technology will be indispensable to improve communication level and social skills training for children with autism. Teachers of inclusive classrooms and special needs children should seek for innovative ways to train on the use of the assistive technology tools and class instruction process.

## Recommendations

Based on the findings of the study, the following recommendations would be necessary

1. Assistive technological tools should be made available to all the teachers in the schools by the authorities concerned to help children with autism to maximize their potentials.
2. To help the children with autism, teachers in the primary schools should be involved with in-service training to expose them to the strategies that were identified from the study.
3. There should be regular workshops organized for parents and serving teachers to expose and train them on more ICT tools that will enhance their communication and social skills that will help children with autism.
4. The federal, state, and local education authorities should provide the needed funds and resources for teacher training, classroom instruction and utilization by pupils with special needs in the schools and community settings.

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