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Focusing on the Utilization of Information and Communication Technology for Improving Children's Potentials in Science: Challenges for Sustainable Development in Nigeria

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Abstract—After the internet explosion in the 90's, technology was immediately integrated into the school system. Technology which symbolizes advancement in human knowledge was seen as a setback by many educators. Efforts have been made to help stem this erroneous believes and help educators realize the benefits of technology and ways of implementing it in the classrooms especially in the sciences. This advancement created a constantly expanding gap between the pupil's perception on the use of technology within the learning atmosphere and the teacher's perception and limitations hence, the focus of this paper is on the need to refocus on the use of Science and Technology in enhancing children's potentials in learning at school especially in Science for sustainable development in Nigeria. The paper recommended measures for facilitating the sustenance of science and technology in Nigerian schools so as to enhance the potentials of our children in Science and Technology for a better tomorrow.

Keywords—Children's potential, Educational system, ICT, Sustainable development.

I. INTRODUCTION

THE pride of any nation is its rich human resources and academic excellence. It is widely acclaimed that education is the backbone for accelerated development needed by every nation that wants to advance globally. Science and technology are increasingly influencing the world's economies and any nation that wants its economy to advance must brace up with the challenges of science and technology. Globalization is the process of transforming local or regional phenomena into global ones. It is a process by which the people in the world are united into a single society and function together. The steady pace of globalization as occasioned by science and technology has made National and international organizations including intellectual property systems evolve means to developing their economies.

The main business of education system is teaching and learning. Its processes are critical in that, it is through teaching and learning processes that children acquire knowledge and skills to enable them become useful members of the society.

Education is an essential tool for achieving sustainability and people around the world recognize that the current economic development trends are not sustainable and that public awareness education and training are keys to moving the society towards sustainability.

Sustainable development is that development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is a process of change in which the exploitation of resources, the direction of investment the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations [5].

The relationship between education and sustainable development is complex, but it is generally agreed that education is the key to a nation's ability to develop and achieve sustainability targets. Education can help improve agricultural productivity, enhance environmental productivity, enhance environmental protection, improve the studies of women, and raise the standard of living. Education can help farmers to adopt new agricultural methods through training from agricultural extension workers. An educated citizenry is vital to implementing informed citizens and sustainable development. Education helps to improve the living standard and economic status of families and help them to live a quality life.

Much of what science and technology have to offer and their potential have not yet been fully developed and internalized in the Nigeria schools. Nigeria needs to attain qualitative education for the enhancement and sustainable development. This is because global competiveness and individuals ability to survive in the contemporary environment is important. For this reason, it is imperative that anything that can lead to speedy transformation of teaching and learning should be incorporated into the classroom. Hence, the on the focus of this paper is on the need to refocus on the potentials of science and technology in schools for sustainable development in Nigeria. The growing importance, increasingly problematic status of science and technology in many countries provides an obvious background to a growing concern about science and technology Education in schools.

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II. INFORMATION COMMUNICATION TECHNOLOGY AND EDUCATION IN NIGERIA

Information and Communication Technology (ICT) is mainly concerned with the use of technological tools for managing the communication process especially in the classroom. [3] Sees ICT as "the communication of technologies for collecting, storing, processing and delivering information to individuals".

[7], described ICT as "the art and applied science that deals with data and information processing". [8], recognized education as "an instrument par excellence for effecting national development and further recognized the crucial role of ICT in fostering a speedy transformation of teaching and learning to the level of acquiring skills necessary for individuals to function in the modern world".

The National Policy on Education outlined the objectives of technology education as follows:-

i. To provide manpower in applied science, technology and commerce particularly at sub-professional grades;
ii. To provide people who can apply scientific knowledge in the improvement and solution of environmental problems for the use and convince of man;
iii. To provide the technical and adequate knowledge and professional skills necessary for agricultural, industrial, commercial and economic development
iv. To give training and impact the necessary skills leading to the production of craftsman and skilled personnel who will be enterprising and self-reliant economically and
v. To enable our young men and women to have intelligent understanding of the increasing complexity of technology.

III. BENEFITS OF ICT IN EDUCATION

The in-cooperation of ICT into the school curriculum will:
i. Facilitate the teaching and learning process;
ii. Promote problem-solving, critical thinking and innovative skills in individuals;
iii. Enhance the various teaching/learning strategies required to meet the needs of the population;
iv. Foster research and development;
v. Support effective and efficient educational administration;
vi. Enhance universal access to information and
vii. Widen access to education and the range of instructional options and opportunities anywhere, anytime, anyplace and any path of learning [7], [14].

IV. IMPACT OF ICT ON CLASSROOM SITUATIONS

Developments in information and communication technologies (ICTs) have impacted all sectors of the society including the education sector. Technology continues to play an increasingly important role in teenaged student's lives so too will it continue to influence their education [10]. The use of technology in the classrooms has had a positive impact on the children, educators as well as the educational system whole and many researchers have observed positive impact in their field work [16].

A research report on the impact of technology on classroom learning observed the following [15]:

- Change in the roles of students and teachers. Students have become more actively involved in the process of learning rather than the traditional passive roles they assume as students
- The teacher instead of being the centre of attention has become a facilitator of the means by which students learn through use of modern technology
- Motivation and improved self-esteem: Students have become more motivated when using technology because it relates to them everyday life and they can see practical implementation of what they learn in the classroom.
- Technology improves technical skills, teamwork and attention of audience especially children.
- The internet itself has unlocked a world of opportunity for students. Information and ideas that were previously out of reach, with a "click away", students share and learn on a global scale. Hence today we live in a technological society. With the increasing availability of hardware and software adaptations, children with physical and emotional disabilities can easily use the computer.

Now we have models with sufficient explanatory power to guide design of software and to permit that design to grow concurrently with the refinement of these models. These theory-and-research-based models specify how students think about specific curriculum content and what learning trajectories we can expect students to follow. They specify the mental concepts children construct and the process they use in acting on these concepts as they move through these trajectories [4]. Haven moved beyond the simple question of whether computers can help young children learn, what we need do now is to focus on is how best to harness the children potentials through Science and Technology i.e. finding out the best way they can facilitate learning, how Science and Technology can meet the needs and diverse dispositions of students in the classrooms.

Teaching with technological tools offer unique advantages for the following obvious reasons.
i. Technology offers the unique ways of assessing children.
ii. It offers the teacher the 'window into the child's thinking process.
iii. Differences in learning styles are more readily visible at the computer where children have the freedom to follow diverse paths towards a goal.
iv. Technology offers us the opportunity to become masters ourselves. It offers the opportunities for learning through exploration, creative problem solving and self-guided instruction.
v. With Technology, teachers can expand beyond linear, textbook based learning and engage students to learn best in other ways.
vi. Digital simulations and models can help teachers explain concepts that are too big or too small or processes that happen too quickly or too slowly to demonstrate in a physical classroom [6].

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V. Negative Impact of ICT on the Children: Challenges for Sustainable Development

The digital revolution hit generation 2, which is also known as the digital generation of youth with a new way of interacting with the world and with their own identities has contributed negatively to the standard of education in Nigeria. According to [14], "children's brains are rewarded not for staying on task, but for jumping to the next thing". He further stated that, the worry is that we are raising a generation of kids in front of screens whose brains are going to be wired differently " these group will grow up to face a significant risk for lifelong problems" since it is obvious that not every use of technology however is appropriate or beneficial. There is need to design a curriculum which will focus on how to use Science and Technology to bring out the potentials of the children in science.

VI. Teachers Perception of the Use of ICT in the Classrooms: Challenges for Children's Potentials in Science

The importance of teachers in achieving education goals cannot be overemphasized because they play a major role in the implementation of the school curriculum. No profession requires the services of ICT than the teacher because he is constantly engaged in research and publication. He is seen as a moral agent in the society whose primary duty is to transmit worthwhile values, knowledge and skills from generation to generation. [19], holds the opinion that the performance of a pupil is a function of what the teacher strongly believes that no matter the time efforts and amount spent to acquire a material or prepare a curriculum, the teacher is needed to operate or implement it, his absence makes the whole expeditions useless".

Two thirds of teachers interviewed on their perception of Science and Technology in the classroom stated that they were not comfortable using technology. Some feared that in the nearest future they will be displaced or thrown out of jobs if this pace of using technology in the classrooms is continued. They further complained that technologies damage the rank of teachers at the classes. This could be linked to most teachers' incompetence and lack of adequate knowledge [1].

VII. Ways of Changing Teachers' Perception on ICT to Enhance the Teaching/Learning Process for the Benefit of Our Children and National Development

To focus on Science and Technology for improving the potentials of children in science, there is need to first make efforts to educate the teachers on the benefits of technology. The reason for this is that the rapid advancement of technology has left most country's educational system in the dust and the educators are scrambling to find a way to catch up with it. Today, both the primary and secondary school teachers have the added burden of grappling with the new challenges arising from the scientific and technological demands of the modern society. Currently, there are debates amongst scholars on the effectiveness of the Nigeria technology based education [12]. The best way is to educate the teachers on the working of the new technologies to enable them to stay afloat in a world of rapid technological advances. Teachers shifting role in Nigerian educational system involves the application of technological innovations to the teaching and learning process. In many advanced countries, Efforts are now being made to adopt a unique technique of educating teachers about it. For instance, in Atlantic City, every year teachers are gathered to attend lectures to learn about the newest technology. For teachers to be innovators and keep abreast with the challenges of technology, teachers need in-service training programmes. These programmes should be constantly organized for them to flow along with the challenges of technology [6].

Another way to keep teachers abreast with the challenges of technology is the use of hands-on experience in encouraging an in-depth knowledge of one programme before switching on to another [20].

According to [9], realizing the potential of technology demands a simultaneous focus on curriculum and technology innovations though effectively integrating technology into the curriculum. Basic science and technology (BST) is an introductory core subject in the first nine years of formal education in Nigeria. It was introduced into the basic level curriculum based on the recognition of the importance science and technology in the growth and development of both individuals and the nation at large. It is obvious of the fact that all developed countries of the world tie their achievements to their scientific and technological advancement [13], [17].

VIII. Challenges for the Application of ICT in Schools

In spite of the achievements and benefits accruing from the use of ICT in enhancing the potentials of children in science there are serious challenges that plague its effective implementation of ICTs in our classrooms. Some of these are:
- poor power supply
- inadequate qualified teachers
- problem of teachers resistance to ICT
- Dearth of infrastructure
- poor curricula review
- poor funding
- dearth of research

IX. Educational Implications of Focusing on ICT for Enhancing the Potentials of Children in Science

The student-teacher dynamic relationship has drastically changed since the introduction of technology based class structure. The teacher is no longer the king of the classroom but rather a mediator between information and the student. Instead of the former passive sponge soaking up of knowledge which according to [11] is mug-jug theory, the student has now become an active informational architect, procuring, rearranging and displaying information inside and outside the classroom.

Many young children have often developed more advanced skills in information and communication technology than their teachers at school. The rapid and constant pace of change in

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technology is creating both opportunities and challenges for schools. The opportunities include greater access to rich multimedia content, the increasing use of online course-taking to offer classes not otherwise available, the widespread availability of mobile computing devices that can access the internet, the expanding role of social networking tools for learning and professional development, and the growing interest in the power of digital games for more personalized learning.

At the same time, the pace of change creates significant challenges for schools to begin with, schools are forever playing technological catch up as digital innovations emerge that require upgrading schools [18]. Success in any undertaking depends fundamentally on the quality of one's consciousness, one's awareness of degree of wakefulness. If the potentials of children in science and technology are fully awake and alert, their thought and actions will be powerful, right for the circumstances and this will lead to increasing success. To develop children's consciousness in science and technology is to develop the quality of thinking necessary for effective action and behaviour with which they spontaneously uphold the progress of their learning endeavours without accumulating stress

The use of technology in science classrooms enables the children to understand concepts better. It helps them improve their skills. The children enjoy learning with technology based materials. Learning is not boring like the lessons learned on the black board. According to [2], the arrival of information and communication technology does not just allow children learn in a new and exciting way. It provides opportunities for them to access more advanced and wider areas of learning and also to develop analytical skills. Today, we live in a technological society, focusing on utilizing these technologies is the best way to reach out to children, especially to meet the global vision of science for all.

X. CONCLUSION

The challenges facing science and technology education have been met in different ways by different nations. Many countries have introduced more as less radical reforms, and there has been support for curriculum development. The reforms in the curriculum have to be directed at both the content framing of the curriculum and organization of the learning processes.

From the forgoing, there is need to focus on Science and Technology to enhance the potentials of children in science for sustainable development.

There is a strong link between a nation's level of development and the level of technological advancement. The latest trend is technology education which is affecting virtually all fields of life and has made the world a global village with its latest internet exploration and electronic mails. The clarion call now is for the need to focus on the potentials of Science and technology improving children's learning for sustainable development. This has occasioned that teachers need to be kept informed in the current educational technology research. This will help the children to keep abreast with the latest technology based learning materials so that they too can contribute in the sustainers of the current trends in development of technology education in Nigeria.

XI. RECOMMENDATIONS

[1] ICT should be made a compulsory course in all teacher training institutions since it improves the potentials of children in science and other related areas.

[2] Every nation will need to re-examine and re-structure its curriculum at all levels (i.e. pre-schools, to professional-education) to a technology based curriculum Activity-packed workshops that involve demonstration with real Science and Technology teaching resources should be organized by highly qualified professional bodies for teachers at regular intervals.

[3] Funding of technological institutions by the federal/state government should be included in the budget allocation to enhance the purchase of the necessary technology equipment for practical.

[4] Government needs to encourage the vision for Technological growth in all ramifications.

[5] To enable it enhance the potentials of children in science.

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