

SCIENCE EDUCATION AND INFORMATION COMMUNICATION TECHNOLOGY (ICT) IN THE 21ST CENTURY: ISSUES AND CHALLENGES

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Abstract

This paper examined some pertinent issues and challenges relating to science education and information communication technology in the 21st century. Concepts such as science education, information communication technology, science education curriculum and content, ICT in education have been discussed. Challenges to science education curriculum implementation mentioned include, environmental factors, resources and culture among others: Challenges of science education in the 21st century mentioned among others include the need to deepen; update and upgrade science knowledge of primary and mentioned also are the challenges of ICT in the 21st century. Recommendations are geared towards the government and other stakeholders to co-operate and work towards effective ICT integration in teacher education programmes.

Science education goes beyond the realms and scope of ordinary education. Ordinary education aims at ensuring permanent change in behaviour, the preservation and transformation of the acceptable norms, values, ethics and more from one generation to the other (Idoko, 2011). Science goes beyond that by not aiming at just the preservation and transmission of scientific culture to its recipients. Rather it is a way of life that is dynamic and holistic. Science education is an objective discipline that aims at equipping its recipients with a holistic understanding of the physical world and its dynamic nature. Science education is an enquiry process that is subject to changes, modifications

and revolution in response to new ideas based on verified facts.

Science education equips the students with science process skill with which to overcome the ever changing world and its inescapable problems.

The objectives of science education in the 21st century may eventually be successfully attained. That was why Mohammed (2008) stated that the critical issues in basic education have been access, equity, quality and management, and that these can be overcome by good information communication technology (ICT). He was of the opinion that appropriate development of ICT will accelerate the attainment of full access. This is because one can get information outside the school system. Even in homes, there can be exchange of Information between the teacher and the learner through ICT facilities.

In science education, many moves had been made to integrate ICT into science education. That is why the Federal Government Incorporated computer education as one of the subjects to be offered at all levels of our educational system. This is expected to prepare an individual for handling the texts, images, numbers and graphs among other signals that occur in ICT devices.

A great deal of research has proven the benefits of ICT in improving quality education (Al-Ansari, 2006). As a result of this, developed nations have integrated ICT into their educational system. The Federal Government of Nigeria in the National Policy on Education 2004 recognizes the prominent role of ICTs in

the modern world and has integrated ICTs into education in Nigeria (Adomi and Kpangban, 2010).

Science Education Curriculum Content and Implementation Issues

Functional education is determined by the quality of the curriculum content and its implementation. Functional science curriculum content must pose the following qualities and characteristics; being valid, significant, learnable, consistent with social realities, useful, and must reflect the interest of the learners. Valid science curriculum content must be related to the philosophy and objectives of science education. Curriculum planners and developers attempted to take care of the above mentioned issues but there are still some barriers to the attainment of the goals. Some of those major setbacks include; overcrowded classes, work overload, and examination malpractices.

Science curriculum specified hand-on activities on processes and skill acquisition, but up till this time most of our children are not exposed to this real life situation in our schools. This is due to the fact that scientific, vocational and technical aspects of education are not being effectively implemented (Nwagwu, 2003). Most of these subjects are not offered because there are no teachers, laboratories or workshops for practical work but curricular policies and practices in the schools have some yawning gaps (Offorma, 2005).

Information Communication Technology (ICT) in Science Education

The importance of Information Communication Technology (ICT) devices in all aspects of education cannot be underestimated. The use of information communication technology can never be neglected if the goals of science education in the 21st century may eventually be successfully attained. Some of the critical issues in basic education have been

access, equity and management and that can be overcome by good ICT (Mohammed, 2008). He is of the opinion that appropriate development of ICT will help in accelerating the attainment of full access. This is because one can now get information outside the school system. There can be exchange of information between teacher and learner through ICT facilities anywhere any day. Learners can now have access to information even in the village. Schools may not necessarily be built in every village before one can have access to information.

For attainment of equity, the information being passed to the urban schools will be the same as the information reaching the rural schools through the full implementation of school mapping and micro-planning. Management and governance of science education programmes are made easy now by the advent of ICT.

Data collection and analysis for effective planning, budgeting and administration are facilitated by ICT services and facilities.

Liverpool (2002) stated that ICT could be used in science education as an object, assisting tool, medium for teaching and learning, a tool for organization and management in schools. It can be used for marking assignments, collecting data, for documentation, conducting research as well as communicating. ICT can also serve as medium through which teachers can teach and learners can learn. The teaching learning process can be in form of dulls, simulation, practice, exercise and education networks. Furthermore, ICT can be used in handling school records, like timetable, attendance, fee collection, examination results, continuous assessment score and database management.

Challenges to Science Education Curriculum Implementation

Science education curriculum implementation in Nigeria is challenged by a number of factors. They include:

1. **Environmental factors:** Physical environment where science curriculum implementation takes place poses serious challenge. Non-availability or inadequacy of space or accommodation, poor ventilation, insufficient light or no light at all, overcrowded classes, make the environment un conducive for science education curriculum implementation.
2. **Resources:** Science resources include human and non-human resources, most of which atimes are not available at all. Some of the resources in some cases are inadequate, available but not functional, functional but not usable. These include the teaching staff, non-teaching staff as well as professional personnel. Thus, capacity building opportunities such as workshop, seminar and conference halls should be provided. Here, square pegs are found in round holes. People do jobs in which they did not receive any training thereby complicating issues. Therefore, they lack the requisite knowledge and skills. The non-availability, inadequacy, non-functioning or non-usable status of these pose serious challenges to science education curriculum implementation.
3. **Culture:** Culture of the people is a significant challenge to science education curriculum implementation. People's culture creates room for superstition. By implication, scientific knowledge must be testable, verifiable and challengeable. Culture sometimes hinders science curriculum implementation processes by influencing negatively the perception and

attitude of learners and teachers towards scientific concepts and activities.

4. **Government policy:** Government policies on education are often not static, they are dynamic and often subject to change with every new regime that comes to power. Issues like funding of science education programmes, provision and maintenance of science education curriculum implementation facilities and equipment; staff recruitment, posting as well as capacity building programme for science teachers are affected by the changes. Again science curriculum changes take place without due consideration for the training of the teachers who actually will implement the curriculum. All these constitute a challenge to the implementation of science education curriculum.
5. **Teacher factor:** These include his qualification/training, readiness or commitment, the teachers' capability in utilizing the necessary skills as well as his method of teaching.
6. **Learners factor:** The learner's interests, readiness to learn, his mental and physical age, his capabilities, previous knowledge or his entry points, all affect science education curriculum implementation.
7. **Effective utilization of ICT services in curriculum implementation:** ICT being a novel tool in Nigerian educational system still has the problem of how teachers can be prepared for the new ICT curriculum with the ICT tools rapidly finding their ways into classrooms.

Challenges of Science Education in the 21st Century

It has become glaringly clear that to meet up with science education in the 21st century, there are innumerable challenges for the teachers, teaching methods, infrastructure, equipment and laboratory management as well as information and communication technology. These include:

1. The need to deepen, update and upgrade science knowledge of primary and secondary school science teachers.
2. The need to recognize that the process of globalization has given rise to new patterns of networking that are changing the way in which knowledge is created, diffused and innovative policies and technologies are repaired to bridge global inequalities including knowledge and information.
3. For the love of their nation, teachers used to make accelerated efforts by embarking on continuous education. This might sound simple but in the absence of resources especially finance and uncooperative posture of administrators, this could serve as a cog in the wheel of progress for science education and development.
4. The need to recognize that global science and technology networks serve as platforms of bringing together relevant social and professional communities to facilitate the expansion of concerted international collaboration to more effectively address the challenges of science education and development.

Challenges of ICT in the 21st Century

Below are some of the challenging issues of ICT:

Human Resources

1. **Teachers:** ICT professionals are not found in the classrooms where teachers are trained. They prefer going to take a better paid job with the oil companies and industries.
2. **Students:** Students are exposed to theoretical aspect of ICT in teacher education programmes without full integration of the practical aspects due to non-availability and inadequate material resources. Furthermore, population explosion in education has reduced to zero, utilization of some of the material resources.
3. **Curriculum issues:** Curriculum is an inevitable aspect of education programme and where the content organization has flaws, it affects the general performance of the students. Taking a critical look at the ICT curriculum, there is need to revisit out rightly, the teacher revitalize educational technology courses and at the same time integrate appropriately ICT for purposeful and meaningful teacher education curriculum enrichment.
4. **Technology products require effective power supply:** The epileptic nature of power supply has adverse effect on ICT education programme. In some schools when there is alternative power supply to PHCN, the generators are always breaking down because of low current supply.
5. **Financial constraints:** ICT requires huge funding for its sustainability and Nigeria as a nation has been facing financial challenges in education.

Conclusion

The concepts of science education and information communication technology have been addressed in this discourse. Science education goes beyond not only aiming at ensuring permanent change in behaviour but aiming at the preservation and transmission of scientific culture to its recipients. It equips its recipients with a holistic understanding of the physical world and its dynamic nature. Science education in the 21st century can be attained if the following critical issues are addressed; equity, access, quality and management and this can be overcome by good ICT.

Information communication technology in science education was also discussed. Finally, the challenges of science education and ICT in the 21st century were properly addressed.

Recommendation

1. Science education at primary school level which is the foundation should be changed to that in which the primary school teachers teach only the subject they specialized in. That will go a long way in enhancing better science education curriculum implementation right from the primary school which is the foundation level.
2. Science teachers should relate classroom science to everyday life in the home and the society at large. In addition, science should also be taught out-side the school. That will bring out the relevance and actual application of scientific knowledge, skills, attitudes and habits in solving everyday problem.
3. Quality pre-service, in-service and continuous service training in ICT driven-environment are of vital importance for the educational system to meet up with globalization.
4. The government and other stakeholders should co-operatively work towards

effective ICT integration in teacher education programmes. This could be achieved through professional development programmes and adequate funding of the educational system especially teacher education.

5. should promote competency-based education and related philosophies. The competency-based approach is performance-oriented which emphasizes pragmatic eclectic philosophies, skill development experiences are defined levels of competence, learning and thinking skill based on experiences.
6. should endeavour to attain the level of teacher as in developed countries. We can only do that by ensuring high quality goals in teacher production.
7. There is need for proper integration of ICT in instructional delivery for purposeful and experimental learning to take place.
8. The government and stakeholders of education should increase their roles in the realization of effective e-learning strategies in schools.

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