

Enhancing the Quality of Science Education Graduates through Innovative Instructional Approach

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Abstract

The building of a country socially, economically and technologically depends largely on its quality of science education and the ability of its graduates to harness both human and material resources and compete favourably in the global market place. The paper examines the quality of education in the light of higher education and innovative instructional strategies that will enhance the quality of science education graduates in the 21st century. Innovative strategies in teaching and learning such as computer assisted instruction (CAI); computer animation, computer simulation, computer drill and practice have been explored. The following recommendations are made among others: Government at all levels must immediately and adequately fund education for the provision of necessary instructional and laboratory materials; and continuous training and retraining of teacher on instructional strategies at all levels to make them current and relevant to the 21st century classroom as the way forward to enhance the quality of university graduates in Nigeria.

Introduction

Education plays a key role in molding the personality of any individuals in a society. It is the process of developing the potentials of an individual by equipping him or her with the required knowledge to live a meaningful and successful life. All over the world, the education system of each nation is expected to help children to develop skills appropriate to the age and to adopt better in the dynamics of the society. Hence, a good system of education should develop an individual holistically; (physically,

socially, emotionally and intellectually). Therefore, education is an enterprise which nations of the world depend on in order to develop the growth of human capital and economically empower their citizens.

Science and Technology Education have become important tools in the world because the economic and political strength of any nation depends on her scientific and technological achievement (Adepitan, 2003). Indeed, Science and Technology are essential instruments for the upliftment of Nigeria's economy. It therefore, implies that for any meaningful national growth and development to be achieved in Nigeria, Science, Technology and Mathematics must be given adequate priority by all stakeholders (Opara, 2004 and Adeniyi, 2005). It is in recognition of this that the federal government of Nigeria stipulated that "special provisions and incentives shall be made for the study of the sciences at each level of the education system. For this purpose, the functions of all agencies involved in the promotion of the study of sciences shall be adequately supported by government" (FRN, 2004)

Science education is the main bases for promoting economic and social development. Therefore, science education should be taught and disseminated in such a way that it will enhance economic development. Therefore, for any country to thrive economically and compete favourably in the global market, place it needs a well trained workforce that is able to create and apply new technologies. The quality of science education is a vital tool that would make the difference in this 21st century, it is vital to national development. The giant strides the developed countries have achieved in science and technology is as a result of effective teaching and learning of science

Defining Quality in Education

Babalola, Adedeji and Erwat (2007) observed that quality has become an integral feature of the education system all over the world and further stress that we are continually faced with quality initiatives and controls. Quality of an educational system is often judged by both its ability to enable the students perform well in standard examination, its relevance to the needs of the individual and society as well as enable the student perform well in the global market. Quality is therefore defined as the ability of something to serve the purpose it is meant to serve. Okebukola (2002) defined quality as "fitness for purpose". This implies that the quality of science education graduates could be measured by the extent

to which they have been prepared and how well they are able to meet the challenges in the teaching field in the 21st century.

Quality education according to UNICEF (2000) includes:

- Outcomes that encompass knowledge, skills and attitudes, and are linked to national goals for education and positive participation in society,
- Processes through which trained teachers use child-centred teaching approaches in well-managed classrooms and schools and skilful assessment to facilitate learning and reduce disparities.
- Environment that is healthy, safe, protective and gender-sensitive and provide adequate resources and facilities.
- Content that is reflected in relevant curricula and materials for the acquisition of basic skills, especially in the areas of literacy, numeracy and skills for life.

Furthermore, UNICEF states that this definition allows for an understanding of education as a complex system embedded in a political, cultural and economic context.

The primary goal of the Nigerian educational system is to provide functional education for the nation, so that the products of the educational system can be employable or be self-employed (FGN, 2004). Hence the need for innovative instructional strategies relevant to the 21st century in training pre-service teachers so that the quality of science education graduates will be improved. Primary schools, secondary schools, public universities, private universities and Polytechnics should move in tandem with the quality of science teachers in the 21st century and provide adequate skilled and quality manpower to enable Nigeria to compete in the international arena.

To ensure that Nigeria produces graduates who are both capable of meeting the national needs as well as taking the roles of global players as well as to compete favourably with their peers from other parts of the world especially the developed countries

Quality of Education in Nigeria

In the last two decades, there has been major concern about the quality of teaching and learning in Nigeria. This is rooted in the realization that one's educational levels will influence individual's job attainment and the general economic wellbeing of society. Moreover, that the level and quality of skills acquired in schools will invariably affect the quality of life in the society (Longe, 1999). Poor

teaching and learning have become the greatest barrier to quality of education in Nigeria today. Poor teaching and learning, according to Babalola et al. (2003), is exhibited in many ways, such as an increase rate of absenteeism and ineffective teachers in schools and the inability of the children (school outputs) to read and write effectively. It has also become clear that graduates of tertiary institutions are often not suitably qualified to fill in the few job opportunities available (Andrew, Bankole & Olatunde, 2000)

The search for innovative teaching strategies is borne out of the fact that there is a general worry about the poor quality of Nigeria students' performance. Several research reports indicated that students performed poorly in Secondary School Science subjects. (Kuta, 2010; Ezenwa, 2005 & Yaki, 2011). Hence, teachers can be assessed by the output/ performance of their students

This leaves one in doubt about the effectiveness of the teaching method popularly used by Science teachers for teaching Science subjects. The traditional lecture method of teaching is very popular and is widely used by Science teachers to convey large volumes of scientific information to senior secondary school students in a bid to prepare them for the rigours of Senior Secondary School Certificate Examination. There is need to find out other innovative instructional strategies that will improve performance and enhance learners acquisition of science process skills.

Andrew et al observed that Employers complain that graduates are poorly prepared for work. They believed that academic standards have fallen considerably over the past decade and that a university degree is no longer a guarantee of communication skills or technical competence. As a result of this, university graduates are commonly viewed as "half baked." Graduates particularly science education graduates on the other hand complain of high levels of unemployment.

Innovative Instructional Strategies

An instructional strategy simply refers to an approach, strategy or a combination of carefully designed classroom interactions that could be followed carefully to pass an instructional content to learners.

The Macmillan English Dictionary (2007) explains an innovative approach as design that is full of new or purposively reconstructed existing ideas. This could also mean using new or reconstructed already existing ideas,

methods, equipment, for example. Innovative teaching strategies are used here with reference to the application of computer to teaching and learning which is an innovation in the 21st century classroom. Some researchers argued that student achievement increases with the use of computer in science education (Asan, 2003 & Usun, 2004). In addition to the above, it is reported that student abilities and skills in scientific investigations are affected positively by the use of computer (Gambari, 2010)

The application of computer to teaching and learning science is an important aspect. CAI is an enriched device in which pictures and process are synchronized for effective teaching and learning process. It has a wide application in education such as: showing case study materials; demonstrating practical activities; and, serves as a tutor teaching new concepts and components (Basturk, 2005). The importance of using computers in a science class may not be limited to the ability of computer assisted instruction (CAI) to improve learning. Rather, the use of computer increases the teacher's knowledge of strategies, which may improve overall learning. Another important reason to include computer use in a science courses is that most (if not all) students, especially those planning a career in science, will be required to be computer literate. As students interact with computers in a variety of ways within their science courses, their degree of computer awareness and literacy will increase.

Computer assisted instruction also provides unique experience to the learners in a science classroom with respect to the presentation of the instructional content. It ensures easy and effective transmission of instruction to the learner as well as caters for individual differences among learners and students who can learn at their own pace. Important diagrams can be magnified part by part so that the slow learners can understand it logically. CAI packages are innovations through computer, for example, Computer Drill and Practice, Computer Animation, Computer Simulation and Computer Tutorial

Computer Drill & Practice

Computer Drill-and-practice is an instructional strategy which involves practicing or repetition of specific skills, task, facts or concepts until they are mastered. The skills built through drill-and-practice should become the building blocks for more meaningful learning. It promotes the acquisition of knowledge or skill through repetitive practice and

are based on question and answer interactions and gives the student appropriate feedback.

Drill and Practice activities help learners' master materials at their own pace and are used as a reinforcement tool. Effective use of drill and practice depends on the recognition of the type of skill being developed, and the use of appropriate strategies to develop these competencies. Ehman and Glenn (1991), in their research, found that drill and practice programs seemed to have positive impacts on student learning and attitude outcomes

Computer Simulations

The Advanced learners Dictionary (2004) define simulation as operation in which a real situation etc is represented in another form. Hence, it is an instructional strategy in which a real situation, concept or a process that may be abstract is represented in another form for easy understanding. Computer simulations are computer-generated versions of real-world objects or processes for example, population growth or biological decay.

Computer Simulation has been found to be more effective than traditional teaching methods in in developing science process skills (Chien (1997); Huppert, Lomask, & Lazarowitz, 2002), as well as in abstract thinking (Berlin & White, 1986), and algebra skills involving the ability to relate equations and real-life situations (Verzoni, 1995).

Computer Animation

It is obvious that the current trend in research all over the world is the application of computer facilities and resources to enhance teaching and learning. Computer animation is an example of the use of computer in the class room. It is the process of providing pictures of an object or event and computer games in which drawings or models of things/objects seem to move in a more interesting and lively way by rapidly showing slides of different pictures of them in a series, one after another on the computer screen. It allows flexibility of learning through a wider range of stimuli involving many sense organs, thus increasing students' engagement in learning. (Yaki, 2011). Findings from other previous researches shows that students taught with computer animation perform better than those taught with alternative method (Tolu, 2009; Mohammed 2004; Kann, Lindemann, and Heller 1997 and Abalaka, 2010).

Other innovative instructional strategies which are activity oriented teaching method include Guided inquiry, Guided discovery, concept mapping, computer concept mapping, Vee mapping just to mention a few.

Suggestions for Enhancing the Quality of Science Education Graduates

In view of the above analysis, the following suggestions are made for enhancing science education graduates in Nigeria:

- **Adequate Funding:** Government at all levels should immediately and adequately fund education for the provision of necessary Instructional materials, laboratory materials and other tools.
- **Instructional Strategies Improvement:** There is urgent need for continuous instructional strategies training and retraining of teacher at all levels to make the teacher current and relevant to the 21st century classroom
- **Improvement in the remuneration and conditions of service for teachers:** There is need for general improvement in the remuneration and conditions of service for teachers, at all levels. This will provide enough incentives to prevent brain drain from the teaching profession and
- **Judicious adoption and implementation of research findings on use of innovative instructional strategies that would enhance the quality of educational practices at all levels of education in Nigeria.**

Conclusions

Kerr (1993), a higher education expert while making observation on higher education systems around the world by saying: "For the first time, a really international world of learning, highly competitive is emerging. If you want to get into that orbit, you have to do so, on merit. You cannot rely on politics or anything else" in view of the above there is no better times than now for the education sector to embrace innovative instructional strategies which encourages meaningful learning and are appropriate for preparing graduates for the outside world as well as compete favourably in this age of globalization. The studies suggest that instructional technology is making significant positive contributions to

teaching and learning science. In addition, instructional technology is apparently being used more effectively in science courses today than it was in the last two decades. We in Nigeria cannot be left out. There should be attitudinal change towards embracing innovative instructional strategies.

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