

NEED FOR ADEQUATE FUNDING FOR THE PROVISION OF QUALITY SCIENCE EDUCATION IN TERTIARY INSTITUTIONS

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Abstract

The paper on the provision of quality science education and the need for adequate funding discussed the concepts of quality education, quality tertiary education and the provision of quality science education. The study highlighted important variables funding can provide in order to improve the quality of science education in Nigeria. They consist of quality staff, quality motivation, quality class size, quality supervision and quality curriculum. Secondary data on the abysmal funding of education for five years was used to buttress the need for better budgetary allocation to the sector. Data show that even with United Nations Education and Socio-Cultural Organization's (UNESCO) recommendation of 26% of total budget to education Nigeria still ranks low in budgetary allocation to education such that in 2014, 2015, 2016, 2017 and 2017 the allocation to education were 10.54%, 10.78%, 6.1%, 5.41% and 7% respectively. The study concluded that the desired quality science education cannot be achieved until government has demonstrated the will to adequately fund education in Nigeria in terms of adequate budgetary provision, quality staff, motivation, quality class size, quality supervision and curriculum. The study recommended that adequate budgetary allocation to tertiary institutions be allotted in conformity with needs assessment of institutions so as to provide quality science education in tertiary institutions in Nigeria.

Key words and phrase: Quality Education, Quality Science Education, Funding

Allocation of funds to education is essential premise for the provision of quality facilities, instructional materials, staff development, staff and students' ratio and supervision in federal and state universities. Despite the benefits of university education to the socio-economic growth of a nation, it has been observed

that the funds, that could have been used to sustain quality of education at this level, appear to be lacking in most universities in Nigeria (Odaudu, 2016). Although these variables are crucial for quality university education, it is suspected that funds for quality university education are not adequately provided and even when they

are provided they may be diverted to other uses. Sometimes it is only when the national universities commission (NUC) have scheduled to visit a university for the purpose of accreditation that funds are made available to the university management. While university programmes wait for accreditation students especially those in the science, are taught below the recommended National Universities Commission (NUC) benchmark as a result of underfunding of federal and state universities in Nigeria.

According to Odaudu (2018), tertiary education is regarded as an instrument of social change and economic advancement through the development of high-level technical capacities. The National Policy on Education (FRN, 2004) specifies that universities in Nigeria should pursue the goals of high level manpower training and the development of physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society. Towards this end, it becomes imperative that the needed funds be provided to defray for cost of education in order to attain these goals.

The Conceptual Clarifications: Science Education

Science education is the field concerned with sharing science content and process with individuals who are not traditionally considered to be member of the scientific community, the individuals could be students, farmers or a whole community. The field of science education includes work in science content, science process, some social science and some

teaching pedagogy. The standards for science education provide expectations for the development of understanding for students through the entire course of study and beyond.

One specific focus of science education may be one of simply learning facts by rote, science education in recent history also generally concentrates on the teaching of science concepts and addressing misconceptions that learners may hold regarding science concepts or other contents. Science education has been strongly influenced by constructivist thinking (Yaber, 2009).

Constructivism in science education has been informed by an extensive research programme into students thinking and learning in science, and in particular exploring how teachers can facilitate conceptual change towards canonical scientific thinking. Constructivism emphasizes the active role of the learner, and the significance of current knowledge and understanding in mediating learning, and the importance of teaching that provides an optimal level of guidance to learners (Taber, 2011). Constructivism views learning as a process in which students actively construct or build new ideas and concepts based upon prior knowledge and new information.

In an attempt to make science education effective and relevant for a large and necessarily more diverse of the population, there is need to transform how learners think so that they can understand and use science like scientists do. But is this kind of transformation really possible for a large fraction of the total population?

Or could science education provide equal opportunity to diverse learners in our society?

Scholars like Taangahar, Idoko and Ukuma (2017) agreed that objectives of science education could be taught to learners at all levels. Enlisting the objectives as to;

- i. Increase learner's interest in things and phenomena of nature and to develop the attitude to pursue the truth.
- ii. Cultivate the ability to think and deal with problems that arise in the physical environment, logically on the basis of facts, and to develop skills for handling machines and tools necessary to the pursuit of experiments and observations.
- iii. Deepen understanding of the facts and principles of natural sciences that are the basis of life and industry to develop the ability to use such facts and principles and moreover to foster the creative attitude.
- iv. Make learner recognize the relationship between nature and human life, and to develop the interest of the pupils in the conservation and utilizations of nature.

Quality Science Education

Quality Science education in Nigeria concentrates on the teaching of science concepts, methods of teaching and addressing misconceptions held by learner regarding science concepts. Science education is very important to the development of any nation and that is why every nation must take it very serious in all institutions of learning, many of the developed nations were able to achieve so

much in science and technology because of science education (Igwe, 2016).

Launching of sputnik by the Russian government October, 4 1957 would not have been possible if not for the position they placed physics in science education. Science education comprises three subjects namely biology, chemistry and physics which are combined with education and over the year there have been low enrolment of these courses. Causes of this low enrolment include society disdain, mockery of teacher and low prestige of teachers. Interestingly, as important as these courses are, students' performance has not been encouraging in them and this is worrisome and called for investigation. The table shows students enrolment and performance in WAEC Examination in the three subjects that make up science education from 2005-2009.

Science is a process as well as knowledge. Children learn science by being involved not only with its contents, but also with its methodology. The effective science facility accommodates both. Science study requires a variety of unique instructional materials in addition to those materials common to education. A science facility must have space to accommodate this variety of combination with hands-on instructional strategies. Science instructional areas have spatial and material needs that are different from those considered in designing a general classroom.

National, state, and local efforts, public and private, are underway to improve science education. Both the

National Research Council, through National Science Education Standards, and the American Association for the Advancement of Science, through “Science for All Americans”, have emphasized the necessity for scientific literacy for all citizens. The maintenance of a democratic society requires this effort. As early as possible, students need to become acquainted with the nature of science and the processes of science. It is imperative that all students have a full science education experience starting in kindergarten, and that an increasing number of students pursue science education throughout their high school years and beyond.

Despite all the great things science education can accomplish in the national development of a nation there are many problems militating against it especially in Nigeria. Science education is very important to the development of any nation in many areas. A graduate of physics education can be self-employed as opined by who of the physics graduates have some knowledge of electronics that is enough for them to be able to have a little period of training as apprentices and then stand alone as electronic technician. For instance, semiconductor physics is very important in the modern technology that if properly learnt it is enough for one to stand upon for a living, semiconductor physics is part of what any graduate in physics will learn and should learn. In semiconductor, is very important in a growing economy like ours in Nigeria; it is useful in ceramic industry and a well-trained physics education graduate can be

well established in ceramic industry. Without science education Information and Communication Technology would be impossible.

Provision of Quality Science Education

Science education is the field concerned with sharing science content and process with learners. They may be pupils, students or some adults. The field of science education includes work in science content, science process and teaching pedagogy. Science content is a body of knowledge used to search for explanation to natural phenomena. This body of knowledge includes knowledge of ideas and facts, figures, equations, formulae, principles, theories and laws that are generated and perpetuated by the scientists. The scientific process consists of systematic observation, measurement, experiment, formulation, testing and modification of hypotheses. When conducting research, scientists use the scientific method to collect measurable, empirical evidence in an experiment related to a hypothesis, the result is aimed at supporting or contradicting a theory (Taber, 2011).

The pedagogy of science education in recent times is inclined to promoting students’ thinking in the study of science; the teacher only facilitating conceptual change towards scientific thinking. Emphasis is laid on the active role of the learner in the learning of science concepts and the teacher addressing misconceptions that learners may hold regarding science concepts. Teaching is informed by the method that

provides an optimal level of guidance to learners.

Science, at the basic education level in Nigeria, is integrated. At senior secondary school science is studied as separate science subjects of physics, chemistry and biology. At the university level science students can be admitted into medical, basic and allied medical studies, engineering, pure sciences and science education. The traditional science education programmes run by universities include physics, chemistry, and biology as well as integrated science (Taangahar, Idoko & Ukuma, 2017). In most universities, as a result of shortage of funds, the science education students take lectures and share facilities with the pure science students. This arrangement may be commendable as it ensures parity and competition among students, it may however lead to congestion of the classes and laboratories as they were not originally designed to accommodate students from other faculties.

The overcrowded nature of classes may also affect the quality of teaching as it is inherently difficult to manage large classes. There is therefore the need to provide funds for quality science education in the universities. In order to provide quality science education in the universities, the university management needs to understand the philosophy and concept of science. The method of teaching science must be related to the nature of science, its means of inquiry, structure of knowledge, its theory and models. In Nigeria, the philosophy is that there is need for functional education and

as such school programmes must be practical and comprehensive for a progressive and united nation. The teaching of science has continued to emphasize practical experiences for the individual. The philosophy, according to the National Policy of Education, is geared towards meeting the national goals of education which are to (i) the inculcation of the right types of values for the survival of the individual and the Nigerian society (ii) the acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for individuals to live and contribute to the development of his society (FRN, 2014). Science is an attitude of inquiry, observation and reasoning rather than memorizing facts or dealing with formulas to get answers.

According to Tanangahar and Orokpo (2018), quality university education involves the coordination of finance, infrastructural facilities, staff, students and education policies. Universities plan, organize and coordinate human and material resources at their disposal for the overall benefit of the society. Thus university products who are awarded certificates are considered to have possessed the knowledge and skills to impact on society, having fulfilled all stipulated requirements.

Ogbonnaya (2009) posits that the input indicates education can be measured through students' capacity, learning environment and the curriculum. Quality in higher education, as determined by the NUC, NBTE and NCCE, involves a multi-dimensional concept which embraces

academic programmes, research and scholarships, staffing, students, building, facilities, equipment, services to the community and the academic environment.

Grants to federal and state higher institutions are supposed to be used for the provision of quality facilities for quality education. In Nigeria, tertiary institutions are believed to receive grants based on sufficient evidence of need. Arrangements are also put in place for the assurance that such grants are judiciously utilized and completed projects inspected before more grants would be released for newer projects. Even though these checks are put in place, standard of 26% budgetary allocation to the education sector by United Nations Education Scientific and Cultural Organization's (UNESCO) has never been met in Nigeria. Thus the need to fund education through corporate organizations, non-governmental organizations, individual as well as the organized private sector, has become more imperative (Ochai, 2012). Education is competing with many other sectors in the face of dwindling allocation from government. For the government to adequately fund universities requires more support from sources other than government sources.

For quality science education in public higher institutions in Nigeria to be in place requires some variables to be in place. These are:

a. Efficient and quality personnel

Quality staff involves adequate number of qualified academic and non-academic staff. Quality staff, according to Ochai

(2012), entails number, qualifications and ethics of teaching and learning in the institution. The provision of quality staffing in universities is perceived to have been affected by lack of financial resources in federal and state universities. Funds are necessary for the employment and payment of staff salaries and allowances in the universities (Ocha, 2012).

Funds are needed to organize interviews for quality staff to be employed. It is also required for the payment of staff salaries, allowances and fringe benefits of employed staff (Okebukola, 2004). Funds are also needed for quality staff development programmes through seminars, conferences and workshops in science education so as to keep abreast with innovations across the globe.

It is, however, observed that financial allocation to states has dwindled thus affecting budgetary allocations to universities. The NUC statistics showed a shortfall of 46% of the required staff population in Nigeria universities was due to lack of funds, even though more academic staff are needed in the universities.

b. Quality class size

Class size refers to the number of students per class (Tyler, 2000). In Nigeria, one of the factors that have had a negative impact on quality university system is shortage of lecture halls. This situation is believed could have a negative impact on quality science education in tertiary institutions. Some tertiary institutions have huge increase in the population of the students

without a corresponding increase in the size of lecture theatres or the number of halls and classes to accommodate the ever-increasing population. In science education laboratories have not been expanded, commensurate to the ever-rising students' population, since they were built many years ago. The problem of number of students per size of class has remained unsettled.

Quality university education is affected when yearly enrolment exceed the available facilities as the staff/student ratio increases beyond manageable proportions. It is expected that where funds are accessed by the institutions, more lecture theatres could be provided; however this seems not to be the case.

c. Effective supervision

Overcrowded classes in the universities affect quality supervision of university education. Udoh and Akpa (2010) consider supervision as the process aimed at improving classroom instruction. According to Ogbonnaya, Oboegbulem, Onwurah and Enyi (2013), it is concerned with maintaining the efforts of personnel in line with the goals of an organization. supervision in the educational set up is divided into instructional and personnel supervision.

Instructional supervision is activities carried out in enhancing the standard of education. Personnel supervision, however, deals with activities by the supervisor with the aim of sensitizing, mobilizing and motivating staff towards performing their duties optimally so as to achieve the aim of quality science

education. Supervisors are expected to provide quality planning, organization, coordination, evaluation and control of teaching-learning processes. This is to ensure that science education is done according to policies stipulated by government. Quality university supervision is believed to be influenced by the level of funding in universities.

Funds are required for supervision towards quality science education which involves internal and external inspection procedures. Internal quality control measures are stipulated by the senate of universities to organise admissions, supervise instructions, conduct examination, certification and discipline staff and students (Uvah, 2005). However, Olagboye (2004) states that most supervisors lack training in supervisory competencies. This is because most senior staff are promoted to supervisory positions on the basis of length of service and not on the basis of appropriate training and competencies. The common excuse for not training supervisors attributed to lack of funds. This lack of training is observable in the level of quality science education in many universities in Nigeria.

d. Adequate motivation

To provide quality science education in the universities requires inducement, incentive, inspiration and encouragement in order to spur personnel into action (Ogbonnaya, Oboegbulem, Onwurah & Enyi, 2013). It is speculated that quality staff motivation can be influenced by funding. Funding could affect quality motivation for educational performance

and competence. University staff motivation can either come from intrinsic and extrinsic motivation. Intrinsic motivation is inherent in the job. It is the motivation an individual enjoys as a result of successfully completing the task. Quality science education can be estimated through staff motivation to teach and students' motivation to learn. Extrinsic motivation is external to the task of the job, such as good pay, conducive work conditions, fringe benefits, security, promotion, the work environment. Extrinsic motivation is believed to be influenced by the level of funding in universities in Nigeria.

Motivation energizes one to perform a task. It consists of intrinsic and extrinsic forms. According to Ochai (2012), intrinsic motivation can be defined as the internal drive directing behaviour towards some ends. It is the force coming from within a person that accounts, in part, for the wilful direction of one's effort towards the achievement of specific goals. On the other hand, extrinsic motivation is said to be the external force that pushes one to perform. Extrinsic motivation is the process in which an individual's behaviour is stimulated and channelled by an organization in ways that should benefit the organization. Akpakwu (2012) sees motivation as the willingness or encouragement to put in extra efforts towards the achievement of organizational objectives by satisfying personnel needs. So, quality science education requires both intrinsic and extrinsic motivation.

e. Good curriculum

University education in Nigeria faces the challenge of improving quality science education. One of these challenges is ensuring quality curriculum implementation and evaluation. Curriculum, according to Denga (2005), is the learning experiences and teaching strategies organized by the school to bring about desired outcomes in the learners. It consists of the statement of aims and specific or behavioural objectives which cover both curricular and co-curricular experiences organized by the school. In the case of university curriculum, these learning experiences are accredited nationally with minimum standards established. With some level of local flexibility to suit peculiar circumstances, with this it can be safely claimed that curricular offerings in Nigerian universities are deemed to have been standardized.

Funds for the review and implementation of curriculum are usually not adequate. Otalu (2009) states that the problem with the Nigerian educational system is not the quality of the curriculum but resources allocated for its implementation. In the science, lack of funds to engage curriculum planners and evaluators has essentially led to low quality science curriculum design and implementation in most universities. In a university setting where innovations are subjected to investigation, through research. It is important that the curriculum be updated from time to time. Sufficient funds should be available for proper review of the curriculum.

Issue of Adequate Funding and Provision of Quality Science Education in Nigeria

Funding can be seen as the act of providing money to finance a need, program and project. According to Hornby (1999), funding is an amount of money that has been made available for a particular purpose. Appropriate university funding could strengthen quality university education.

According to Oralu and Oladele (2015), adequate funding could defray for and provide basic requirements for the achievement of educational goals for each level of education. These requirements include infrastructure, equipment and learning resources and personnel (Okeke, 2005). Infrastructure required involves building, housing, classroom, lecture rooms/halls/theatres, laboratories, workshops, administrative blocks with furniture and workbenches. Equipment involves science equipped laboratory. Workshop, consumable and non-consumable materials, computers, photocopies and communication equipment. Learning resources include libraries, internet facilities and playground with standard pitches for games and sport. Personnel imply the involvement of emoluments for academic and non-academic staff as well as coordinating ministries and parastatals. Government agencies concerned with funding of tertiary institutions are the ministry of education, NUC, NBTE, NCCE and TETFund.

The rundown of the situation is that the education sector in Nigeria is

grossly under-funded. The Education Tax Fund (ETF) and TETFund have come in to intervene in the provision of the much needed infrastructure (Okebukola, 2004). Budgetary allocation to education showed that in 2014 the allocation of N494,783,130,261 representing 10.54% budgeted was allocated education. In 2015 N484,263,784,564 representing 10.78% was allocated to education. These two were allocation made by previous government. Although the budgetary allocation by the previous government (2014 and 2015) were not up to 50% of UNESCO's recommendation, it was better than the allocation to education by the present government. The Jonathan administration provided an average of 40% of the budget for 2014 and 2015 while the present Buhari government has provided a budget of an average of less than 30% for 2016, 2017 and 2018. It is expected that the present administration which has made huge recoveries from fighting corruption will adequately fund education, however, funding education has rather taken a sharp decline. Economic indices which affect access to quality of education show the recurrent expenditure of N398.01 billion in 2017 budget of N7.2 trillion. This represents 5.41% of the total budget, a reduction by 1% from the 6.1% allocation in 2016, in the 2018 budget N605.8 billion, representing only 7% of the total budget of N8.6 trillion allocated to education. This meagre allocation to education for 2017 budget is a sign that the government is not ready to adequately fund the education sector, such as infrastructure deficit and low staff morale

in tertiary institutions (Taangahar and Orokpo, 2018).

Conclusion

The paper concludes that funds are needed for the provision of quality class size so as to accommodate any large number of students as well as to provide appropriate teacher-students ratio for effective science teaching in universities, also for the recruitment of staff for the provision of quality science education in the universities in Nigeria. Funds are required for the proper motivation of staff to do more providing the needed service in science teaching in universities. Funds are lacking for adequate training in supervisory competencies. Most supervisors in universities become supervisor because they were promoted on the basis of seniority and length of service but not on appropriate training and qualification. In Nigeria most curricular are well-planned but the implementation not done as required (Oralu and Oladele, 2015). Funds are not sufficiently supplied for quality implementation of the university science curricula.

Recommendations

Based on the needs assessment of the various tertiary institutions funds should be provided in areas of:

1. Employment of recommended staff so as to provide quality science education in the universities in Nigeria.
2. Motivation of staff to ensure that they put their best in providing the needed services in science teaching in universities.

3. Provision of quality class sizes so as to accommodated large classes and appropriate teacher-students ratio for effective science teaching in universities.
4. Adequate training of supervisors in universities not based on seniority and length of service but on appropriate training and qualification.
5. Quality implementation of the science curricula of the various tertiary institutions.

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