Repositioning Integrated Science Curriculum for National Growth and Development

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Abstract
The importance of Integrated Science curriculum to nation's development cannot be overemphasized. In Nigeria, issues such as poor academic performance of students, low quality of graduates, inadequate funding, lack of equipped laboratory and workshops, low quantity, quality, and commitment of teachers, inappropriate curriculum are prevalent in Integrated Science education provision. To improve the state of science and technology from its status quo and reposition it for the 21st century, adequate funding, provision and furnishing of laboratory and workshop, provision of scholarships and bursaries for students, regular review of science and technology curriculum, provisions of ICT in teaching and learning, recruitment of more qualified science and technology teachers, as well as motivation of science and technology teachers are recommended.

Keywords: *Integrated Science, Curriculum, national Growth, Development*

Introduction

The need to reposition Integrated Science curriculum to meet the 21st century scientific and technological demands cannot be overemphasized. However, it is pertinent to understand what curriculum is, as its definition has evolved over time, driven mainly by contextual factors as well as intellectual perspectives.

The word Curriculum is not universally used, though it is progressively becoming mainstream. Some regions of the world use expressions like study programs, course of study, syllabi, teaching subjects, courses, etc. It is rarely used in reference to post-secondary education. Commonly used at the tertiary level are study programs and courses. The most enduring and pervasive definition of "curriculum", has its roots in the Latin word currere meaning a race course or a course to follow. From this root, curriculum is commonly conceived as "a course of study" or "a plan for learning" (Taba, 1962). Curriculum is an attempt to communicate the essential principles and features of an educational proposal in a form capable of effective translation into practice, yet remaining open to critical scrutiny (Stenhouse, 1975). Its structure is most often outlined across four dimensions; aims or objectives, content or subject matters, methods or procedures, and evaluation or assessment" (Scott, 2008). A broader concept that goes beyond structured programs defines curriculum as the totality of the experiences a pupil has, as a result of the provision made and the values that underpin and guide it in practice in terms of the intention of the planners; the procedures adopted for the implementation of those intentions, the actual experiences of the pupils resulting from the teachers' direct attempts to carry out their intentions, or the planners' intentions, and the hidden learning that occurs as a by-product of the organization of the curriculum of the school and indeed of society (Kelly, 2008). This definition introduces societal values as integral to the concept of curriculum. It highlights that beyond just a course of study and a plan for learning, curriculum is an expression of what society values and what it therefore expects from its education system. Accepting curriculum as a signal of what society values brings in exclusion as another form of expressing value. This widens the concept of curriculum beyond what is included to what is excluded, omitted or neglected or the null curriculum (Eisner, 1994). The definition also introduces what is commonly referred to as a continuum of curriculum, comprising the (i) official, intended, written, formal, ideal, planned, specified curriculum; (ii) implemented, mediated, taught, operational, or in-use, curriculum; (iii) actual, experiential, learned, received, achieved, internalized curriculum; and (iv) assessed curriculum (Cuban, 1992; Harland, 2002; UNESCO, 2012). It introduces the unintended or the hidden curriculum and broadens curriculum to cover all that learners learn from schools be it intended or unintended. With the recognition that education and learning are not necessarily confined to schools or education institutions, there emerged categorizations of curriculum by learning contexts: formal, non-formal, and informal or societal curriculum (Cortes, 1981).

Problems facing integrated science curriculum.

Scientific knowledge is the common heritage of humankind. It is the only this treasure of humankind that can provide a possible remedy to conquer inequality and to bring about an acceptable quality of life and a purpose, for a majority of the people of the world. A case should be made for Integrated science and science education curriculum in the developing world, a case for optimal support for integrated science curriculum and science education even in the poorest

and the least-developed of the countries of the world. Some of the main problems that should be overcome for a sustainable and proper science education are;

1. Inadequate funding: Inadequate funding is a very big problem facing Integrated Science curriculum in Nigerian educational institutions. Funds released for the implementation of science curriculum in public institutions are not adequate to implement the programme (curriculum). Many head of department of sciences programme cannot access funds from the school administrators to execute their programme. Ahmed, Emeka & Ogunode (2021) submitted that inadequate funding is a major problem responsible for poor development of Integrated science curriculum. Science education is very expensive and cost effective. The annual budgetary allocation for the primary school education is inadequate. Ezechi & Ogbu (2017), submitted that funding science programmes and science related research has been a major problem facing technological growth and self-reliance in Nigeria. Government do not adequately fund science and science related programme and research. In addition to this, the little fund provided relapse and are embezzled by top officials in charge of its implementation. Reasons for shortage of funds in the implementation of science curriculum include corruption, poor financial planning, increased in population and lack of political will to increase education funding. Ogunode (2020); Ogunode & Jegede (2019) agrees that shortage of funds is a major problem affecting the implementation and development of science curriculum in Nigeria.

2. Inadequate Laboratories: Inadequate laboratories is another big problem facing science teachers teaching in public schools in Nigeria. The laboratory is where science students engaged in hands-on-activities (Ekanem, & Obodom, 2014). Such as observations and experiment. Renner (2003) asserted that practical work in science assumes an important role in the development of the psychomotor domain of the taxonomy of educational objectives. The availability of science laboratory makes science lessons concrete and stimulating which helps to enhance the achievement of students in schools (Ekanem & Obodom, 2014, Farrant, 2002). Many schools do not have adequate and well-furnished laboratories for teachers and students to carry out practical. Ezechi & Ogbu, (2017) submitted that majority of Nigerian schools lack laboratory spaces, those who have spaces lack equipment and necessary infrastructure for proper teaching and learning of science. Science therefore is not miracle where something happens out of nothing. Also, Osuolale (2014) acknowledged that most laboratories are not well equipped, schools rely more on imported laboratory apparatus and equipment and grants are never enough. Although government took a giant step by establishing science laboratory manufacturing industries like 'PRODA' Enugu, such industries have been long neglected by the same government that established them. Akpan (2002) observed that Nigeria problems have been that of implementation. He said that a visit to primary and secondary school science classrooms by a well informed and concerned science teacher will show that the nursed hope in curriculum reform are expensive venture in the past decade. If any science is to be taught well, it should be taught practically, hence the need for sufficient materials for effective teaching of science within and outside the laboratory is necessary for proper implementation of science curriculum.

3. Shortage of Instructional Materials: Shortage of instructional materials is a major problem facing science curriculum implementation in Nigerian. Many do not have adequate instructional materials to deploy for teaching and this is affecting the learning processes of the students. Students learn fast when instructional aid are applied in the implementation of the teaching.

Omorogbe and Ewansiha, (2013) observed that lack of ideal resources for science teaching and learning in Nigerian schools has been a major issue of concern. It is a well-known fact that the quality of education a student receives largely depends on the quality of teaching/learning resources provided. Teaching learning resources are all the things used by the teacher during teaching to aid understanding and make teaching successful and effective. They include, modern textbooks, equipment, consumables like chemicals and reagents, models, charts etc. and the physical learning environments which include the science classrooms and laboratories (Olatunde-Aiyedun, 2021b). One of the major objective of integrated science is to teach students the scientific process (Orji, Ogar & Aiyedun, 2018). Students need some investigative skills such as observing, measuring, classifying recording experimenting, analyzing inferring, etc. Ogunmade (2006) stated that "Majority of students do not have textbooks and most of the schools do not have libraries and where they have one, the textbooks in the libraries are outdated. Opara & David (2014) investigated the factors that affect teaching and learning of Basic Science and Technology in primary schools.. Ogunode, Okwelogu and Olatunde-Aiyedun (2021) acknowledge that Nigerian schools at all levels are lacking the essential materials for learning, especially for science practical classes. This, no doubt, affects the learning process. Most schools lack science materials, and those that claim to have are managing the old ones. Hence, the students only cram theoretical steps rather than carrying out the practical. Also, many schools and colleges have building that they call library, but most of these so called libraries are not equipped with needed books, journals and magazines. Reasons for shortage of instructional materials including inadequate funding, poor planning, corruption, poor maintenance culture and poor school security.

4. Inadequate Infrastructural Facilities: Ogunode and Agwor (2021) viewed school infrastructural facilities as social capital within the school environment. They include school buildings/complexes such as classrooms, s, laboratories, workshops, studios, farms, gymnasia, central libraries, specialized/professional libraries etc. Specialized facilities e.g. ICT infrastructure, special laboratories, conference facilities, etc., and ICT that is computer laboratories and services, network connectivity, multi-media system, public address system, slide, and video projectors, and Ergonomics furnishing in laboratories, libraries, and lecture rooms/ theaters, moot courts, and studios, etc. Students' hotels or accommodation include Boys and Girls hostels; municipal/physical infrastructure i.e. power supply, water supply, good road networks, sports, health and sanitation. As important as the infrastructural facilities to the realization of science education objectives in secondary schools, it is unfortunate that many schools do not have adequate offices for teachers and classrooms for students. Ogunode, Eyiolorunse-Aiyedun and Olatunde-Aiyedun (2021) observed that classes are always crowded with up to ninety students in class designed for about thirty students in most cases, especially in public schools, chairs are not enough. Students will be sharing seats and some would start to receive lectures. And where by students are learning science subjects, they will lack concentration as they would be easily distracted. Omorogbe, & Ewansiha, (2013) observed that due to the fact that majority of schools lack the essential resources for imparting the knowledge of integrated science concepts to students, many students learn little science, learning tends to be by rote and many students find science not interesting and boring (Ogunmade, 2006). Audu and Oghogho, (2006) submitted that the teacher student interactions in many science classrooms are not healthy because of lack of adequate resources. In most of our schools, there are no facilities for the teachers to demonstrate phenomena, let alone allow the students to have opportunities for

finding out things for themselves. Reasons responsible for inadequate infrastructural facilities according to Ogunode & Agwor (2021) are inadequate funding of schools, poor infrastructural facilities planning, poor qualities of infrastructural facilities, institutional corruption, ineffective monitoring and evaluation of infrastructural facilities, increased in student population, damages of facilities by students.

5. Ineffective Supervision: Ineffective supervision of science curriculum is another big problem facing Integrated science curriculum in Nigerian schools. Supervisors are professionals employed to help the teachers who's are the implementers of curriculum to grow professionally. Ogunode, Olatunde-Aiyedun and Akin-Ibidiran (2021) observed that the basic function of the inspectorate is to maintain effective instruction in schools. But due to the acute shortage of properly trained personnel in this field, effective supervision has been unavailable, thereby promoting nonchalance attitude among science teachers towards implementation of integrated science curriculum.

6. Poor Curriculum Development: Science teachers faces many challenges in implementing Integrated science curriculum due to poor planning and development. Integrated Sciences teachers are not fully been involved in the Integrated science curriculum planning and development. Adikwu (2008) stated that the problem with science education is a lack of good curriculum, that curriculum must be developed, and that there should be a readily-available inquiry based curriculum. He went further to observed that one reason to develop new curriculum is to introduce modern scientific techniques derived from current laboratory experiments. He also advised that teachers should always be trained on any new curriculum while Adeyegbe (2004) noted that some of the contents of science curriculum are of little relevance to the general education of the intended level and cannot even be covered within the time limit. Other researchers also held the same view based on investigations. They therefore concluded that if the objectives of science education are to be achieved for sustainable development, that curriculum planners should review and update the curriculum.

The fact that curriculum means many things to many people, different people reflect a healthy complexity of the concept. However, repositioning of integrated science curriculum will ensure optimum contributions of Integrated Science curriculum in meeting demands and opportunities of the 21st century in general. Repositioning of curriculum proffered in this document applies to all levels and types of science learning: as well as to all levels and types of learners. Repositioning will allow vertical articulation of science curriculum which is critical in every levels of science education and will support lifelong learning. Repositioning will allow horizontal curricular articulation, synergies, complementarily, and mutual reinforcement, for further reinforcement of lifelong learning of Integrated science and science in general.

This paper have tend to equate relevance with responsiveness to Integrated Science curriculum with current standard of education in the society at large. Relevance is used to mean responsiveness and initiative. Integrated Science curriculum must respond to fast changing, unpredictable and often disruptive contextual challenges and opportunities in the societies more importantly, they must initiate and catalyze positive contextual changes and disrupt the negative status quo which we lead or bring about positive innovative system embedded into integrated

science curriculum. Integrated science as a mother of sciences, the curriculum has to be in line with current trend in the society that can yield more development that we be relevant to the current society norms and values. Integrated science curriculum has to be redesigned to mitigate the current problems in the society or nation at large, it should be a problem-solving curriculum rather than one- way education developer. For the sustenance of Integrated science as a leading science oriented programme, it must be anchored in the national development potentials. It must cover every sectors on the demands side of education and learning, if Integrated Science curriculum are to attain and sustain relevance in nations of the world it must include educational specialist of course, but must be guided by development specialist. The current Integrated Science curriculum grossly limit the role, significance, and potential impact of curriculum in the **21st** century, within the education **2030** agenda. To realize its full potential, the world needs paradigm shift that repositions curriculum in the 21st century, with education **2030** Agenda. This shift should be necessarily including factors that are essential for curricular impact vis teaching, learning, assessment, and enabling implementation environment. Without paradigm shift, integrated science curriculum will continue to fail to facilitate learning, they will continue to register poor learning outcomes, and they will remain irrelevant for future generation. They will perpetuate and even widen inequities between the developed and the underdeveloped world. All this is anathema to the spirit and letter of SDGs and a serious threat to global peace, security, stability, growth and development of our nation.

As globalization accelerated, repositioning the curriculum become necessary, the world becomes more connected, and outsourcing services across borders becomes the norms, people competences to collaborate across national and virtual boundaries to share information and emerging knowledge in other to find lasting solutions to the current trend in the society. This document acknowledges that the articulation of curriculum is both a political and technical process that engages a broad base of stake holders and engenders stakeholders support and ownership. Credible curricular processes are necessarily inclusive and consultative. Involve stakeholders reach far beyond the boundaries of the education sectors and of technical experts in education. they include professional, local, national, and global communities at large. This because curriculum determine the fate of individuals, communities, countries, and the world , by determining what, why, when, and how people learn. The new paradigm recognizes curriculum as a more dynamic, complex, and multi-dimensional concept than its current position portray. It therefor calls for repositioning of curriculum along the following key dimension:

A catalyst for innovation, and educational transformation:

In a proactive role both formal and informal curriculum are powerful catalysts for educational change, and transformation. Curriculum can change attitudes and mindsets, curriculum can construct and deconstruct educational order. Care has to be taken to ensure that curriculum support desirable educational order marked by equity, inclusion, and equality etc.

A force for social equity, justice, cohesion, stability, and peace

As much as curriculum is transformative, it is among the most profound stabilizing forces. It is through curriculum that societies conserve and pass on their values of education, age-old wisdoms, heritages, and accumulated expertise to new generation. Curriculum are key to socializing forces and even control that through which societies cohere.

Curriculum as an integrative core of education systems: Adopting and sustaining a system approach to education and learning remains a challenge in many countries. Because curriculum relates to most elements of an education systems, it can serve as an integrative force to engender a system approach to education and learning. Curriculum leads teaching, learning, and assessment. Among others, repositioning determines the physical teaching and learning environment (infrastructure, books and learning materials, consumables, furniture, equipment, etc.), and education personnel, especially teachers.

curriculum as an enabler of lifelong learning: the fast pace of change in the 21st century implies that many of acquired competences become obsolete much faster than in prior centuries. Adaptability to fast changing contexts demand effective lifelong learning, which has become the key source of human resilience. The first and most critical competence that curriculum should enable learners to acquire is "how to learn". With this facility, the "what" of learning will fall in place. If curriculum is well repositioned, it can be a key enabler of lifelong learning. Learning through levels of education system, requires smooth transitions through levels of the system which demands a vertical articulation of curricula, as a basic principles of curriculum design.

Curriculum as a determinant of the quality of education and learning

Hardly requiring mention, the curriculum determines what is learned, by whom, why, how, when and in what sequence. It leads key processes that are fundamental to quality of education and learning. Key among these are : teaching, learning, and assessment. When these processes are not led by curriculum, there is often a diminution effect along a continuum of the official, taught, learned and access curriculum. Effective curriculum implementation supports the improvement of learning outcomes. it is not possible for actualization of stated objective of education, without due recognition to the role, significance, and potential impact of curriculum.

Curriculum as a determinant of key cost drivers in education and learning systems: For any education system, key cost drivers are the number and level of teachers, and the implied salary bill. Next in significance are teaching and learning materials including textbooks, equipment, and consumables. These are followed by the physical infrastructure. All these elements are determined by the curriculum. Other than the sheer number of learners, the curriculum determines the type and levels of teachers required to deliver it. This is more so for the post primary levels. The curriculum also determines requirements for the physical teaching and learning environment including the physical infrastructure, textbooks and instructional materials, equipment, and consumables. It equally determines the scope of assessments, be they local, national, or global. Analysis of the cost and financing of education systems have to pay particular attention to curriculum as a key determinant of costs, and by implication, efficiencies. Yet, such analyses hardly make links to curriculum. For example, teachers, and the physical teaching and learning environment are factored into analyses as key cost drivers, yet little attention is paid to what drives demand for those cost factors, other than the size of the student population.

Repositioning curriculum at the core of the economics of education: The curriculum is at the core of the economics of education not only through its centrality to development relevance, but also as a determinant of the cost and enhancing of education and learning.

Repositioning curriculum at the core of education system resource efficiency gains: As noted, curriculum drives demand for all key education resources. This includes: (i) human resources, especially teachers; (ii) time for teaching and learning; and (iii) all key elements of the physical teaching and learning environment. Any effort to raise resource efficiency gains has to pay considerable attention to the curriculum.

Curriculum as a lifelong learning system in its own right:

21st century curricula are intensively challenged to sustain relevance to rapid, unpredictable, and sometimes disruptive contextual changes. An even bigger challenge is for curricula to not only react to contextual changes but to also lead them. To effectively play the reactive and proactive role, curricula have to themselves be lifelong learning systems. Mechanisms have to therefore be built to ensure constant self-renewal of curricula sub-systems, lest they risk being irrelevant. The ever-escalating pace of change challenges traditional durations of curricula reforms which often take years. 21st century curricula have to have the foresight, anticipatory, and regenerative capacity for constant self-renewal, to adapt quickly, and to be innovative

In a view in repositioning curriculum, the following are to be considered to meet up the current trends in national growth and development.

1. **Provision of Adequate Information and Communication Technology Facilities:** Considering the role of information and communications technologies (ICT) in repositioning curriculum, this can include serious and critical engagement with blended and other learning modalities. It is no secret that making productive use of ICT in curriculum, teaching and learning can be costly and is fraught with challenges. It is, moreover, very difficult for this modality to gain traction in any educational environment. The potential here is enormous: blended learning modalities, ICT competencies, universal access to digital technologies and their advantages — these are at the heart of curricular innovation in this domain. The developmental context the world finds itself in and the context that young people will live in as they grow up, are rapidly evolving. It is important that we deal with the fact that — while some elements may be beginning to change — most of today's curriculum and what is actually being taught and learnt has not changed a lot compared to the profound transformations affecting society and economy, at both local and global levels. Development requires humans with more capabilities, and many of these capabilities come from a productive and creative use of technology. Most of the world's young people already grasp, at some level, that if they lack the enhancements technology now brings they are, in their own times, "humans with fewer capabilities". The cleverest are quickly becoming adept at employing whatever technology they can get access to in order to enhance their lives. We need to reconcile the old and the new and get technology into the hands of those who lack it. At the same time, though, it is also imperative to bear in mind that digital technologies are truly valuable only if we create the infrastructure for connecting to the world. And as we connect people, we must figure out ways to help people use technology in their lives and develop a new critical competence of selecting information while learning and retaining key values and skills. Most importantly, we should not use digital technologies as a new medium to deliver old material, maintaining almost unchanged the traditional structure and organization of the curriculum as well as the approach to teaching and learning. The

many positive effects and the powerful and transformational powers that digital technologies offer to bear on education, curriculum and learning, are being celebrated since more than thirty years. Yet it doesn't seem that most of the expected positive transformations have taken place. Many countries have adopted an educational ICT strategy and in many (advanced) contexts schools, students and teachers are now equipped with technological devices such as desktop/laptop computers, personal digital assistants, smart phones and tablets. However, it is likely that teachers are using those devices — if they get used at all — mainly to transmit information using traditional pedagogical approaches. If digital technologies offer only a new way to deliver the traditional curriculum and content, we have — educationally, and in terms of preparing new generations for the future — missed a huge opportunity. Technology should be, rather, enabling hosts of new things that education has never before the opportunity to provide: connecting in real time around the world and receive instant feedback; using databases and computation engines to discover new relationships; programming increasingly powerful machines to extend our capabilities; making and using simulations to get new insights; creating new, useful objects through 3D printing; and so forth. To make digital technologies effective and worthwhile, they must be used not just as a new way to do old things, but as a foundation for the education, curriculum and capabilities of the future.

2. **Provision of entrepreneur/skill acquisition development:** repositioning of curriculum is important to meet the current economic reality of 21st century. The entrepreneurs are often known as a source of new ideas or innovators, that can bring new ideas to the educational sectors by replacing old with a new invention. **Innovation** should be highly encouraged to generate new ideas, groom new learning skills that can benefit both the old and new generation of the society. Change can be the launching of a new idea that is new to the educational sector or a process that does the same thing but in a more efficient and economical to national growth and development. Curriculum should be productive, flexible and skillful with visitionary qualities that can enhance national growth and development.

Recommendations

The following recommendations are made to enhance the repositioning of integrated science curriculum for national growth and development.

(1) **Provision of Adequate Funding**: There is need for the government, organizations, individuals and institutions of higher learning in the country to adequately fund education sectors to enable curriculum expects reposition science curriculum to enhance the standard of education and learning.
(2) **Provision of and furnishing of laboratory and workshop**: the standard of laboratory should be enhance to meet the current societal challenges, government should make adequate provision of laboratory equipment and training and retraining of Integrated Science teachers for effective deliveries.
(3) **Regular review of Integrated Science curriculum**: for any meaningful development in education sector to be achieved, government should imbibe the culture of and regular

review of Integrated Science curriculum that we enhance repositioning by curriculum expects.,

(4) **Recruitment of qualified Integrated Science oriented teachers as well as motivation of Integrated Science teachers**: Repositioning of Integrated Science curriculum can be achieved with qualified Integrated Science background, government need to wage into action by recruiting qualified Integrated Science teachers for better reposition of curriculum for national growth and development.

(5) **Provision of ICT**: with provision of ICT, leaning resources distributed via internet and video resource are also considered important in improving science curriculum.

Conclusion

For us to actualize the aims and objectives of quality education for national growth and development in our society, it we be habitual to reframe the scope of Integrated science curriculum to meet the present global demand to ensuring sustainable development relevance to education and learning system. Integrated Science curriculum should recognized information and communication technology, and innovation and skill transformation, . Integrated science should be a lifelong learning and determinant of the quality of education system in our society.

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