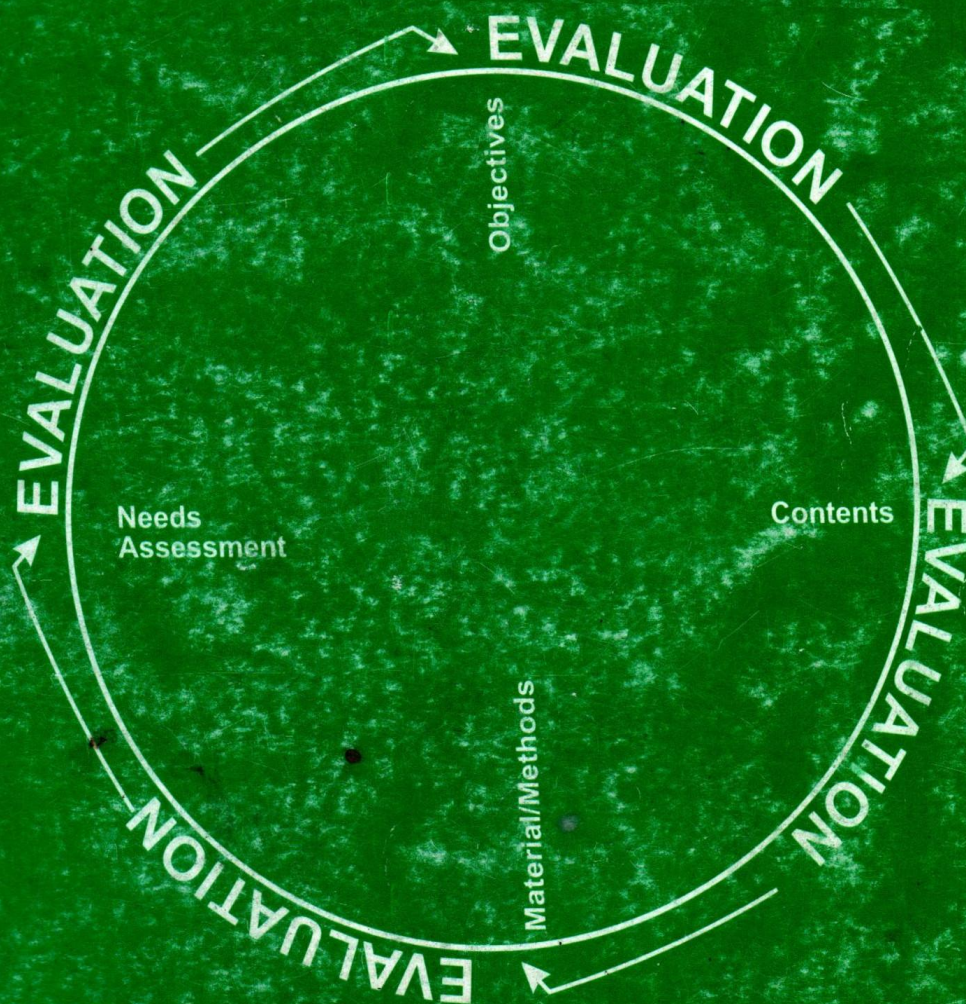


ETIUBON

Nigerian Journal Of Curriculum Studies

Vol. 1st No. 1

June 2011



Journal of Curriculum Organisation of Nigeria (CON)

Curriculum Innovativeness In Science- Technology Content And Teacher Adaptation In Nigeria

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Abstract

The study examines curriculum innovativeness in science-technology content and its teacher adaptation in Nigeria. Science and technology have become social factors in the development of the nation. Secondary school science is the building block for universities, monotechnics and polytechnics and science laboratory should be the pillar of technology and research work to broaden the scope of students. The paper identified the inadequacies of the curriculum as it does not reflect flexibility and scientific cultural sensitivity of its users. The paper gives reasons why there should be curriculum innovativeness and the need for teachers to adapt it to Nigeria. The study gives insight into problems militating against curriculum innovativeness and teacher adaptation. Recommendations proffered among others were that; science laboratories in schools should be revamped to boost the mindset of students and research-based innovations should be the drive towards scientific and technological knowledge since this is a sure way to better living.

Introduction

The future of science education demands innovativeness in the curriculum for scientific and technological skills, knowledge and attitudes to empower the learner withstand socio-economic challenges. A curriculum that is functional, qualitative and catalytic for development, job creation and poverty alleviation is needed. This should be the foundation for Nigeria's envisaged scientific, technological and industrial revolution. This curriculum must be dynamic and have a driving force to push science and technology towards viability in articulating needed changes that will harness and boost hidden talents and potentials of its users. There are students who cannot read curriculum materials because they are irrelevant to their needs and aspirations; teachers who cannot teach; schools that are poorly administered; and poor instructional materials and facilities. These lead to poor teaching. Improving the quality of education through diversification of curriculum contents and methods, promotion of experimentation, innovation in diffusion and sharing of information and best practices as well as policy dialogue are UNESCO's strategic objectives for Education (UNESCO 2002). Innovation in science and technology education has, therefore, been recognized as an essential component for a country's development (ICASE, 2010). Curriculum innovativeness and its teachers' adaptation are heavily interlinked. Countries today are moving along the path of knowledge-based science and technology development. The transfer of skills preparedness and best practices for innovation in scientific and technology-based education cannot be done haphazardly; it has to be creatively planned, organized and systemized.

This is the idea of curriculum innovativeness and the ways teaching teachers can adapt to science teaching. Quality teaching for quality education should effectively adapt curriculum changes to influence students' learning habits and the use of appropriate teaching models and improved pedagogy strategies and procedures in teaching. Curriculum which ensures teachers' flexibility in management of classroom challenges through innovative adaptation of appropriate teaching and learning tasks should be a very useful tool. After planning the curriculum for all levels of education, there is need to diversify ways of creating its teaching content and learning experiences (Ekpo, 2010).

This paper therefore looks into curriculum innovativeness and its teachers' adaptation to the learning and teaching content of science. This is treated under the following subheadings.

Issues in Curriculum Innovativeness

1. Concept of curriculum and curriculum innovation
2. Research-based curriculum innovativeness
3. Policy development and practice for curriculum innovativeness
4. Collaborative interaction between curriculum planners at different levels of education
5. Teacher training for innovative adaptation
6. Development and production of innovative instructional materials
7. Short and long term planning for curriculum innovativeness
8. Reasons for curriculum innovativeness and teacher adaptation in curriculum content and learning experiences.
9. Problems militating against curriculum innovativeness and teacher adaptation
10. Recommendations and Conclusion

Concept of curriculum and curriculum innovativeness

Curriculum is defined by Okonkwo and Ozurumba (1989) in Anene (2005) as a structured series of intended learning experiences provided and directed by educational institutions to achieve predetermined goals. Godwin (1981) also noted curriculum to be planned and directed activity programme meant to facilitate the achievement of educational purposes that are logically connected to a set of conceptually and pedagogically analysed knowledge and value claims. These can enhance relevant and appropriate knowledge innovation that can be achieved to change society for the better. Educational purposes can only be achieved if curriculum content and learning experiences are properly innovated and adequately adopted by teachers. Innovation is often times used interchangeably with change, adaptation and reform in educational circles. According to Mintrom (2000) in Ajibola (2008) an innovation is an idea, practice of object that is perceived as new by an individual or other units of adoption. In terms of curriculum; innovativeness includes introducing new curriculum contents, integrating specific curriculum materials, modifying instructional aids and strategies, integrating different modes of organization and educational principles. Curriculum innovativeness involves broadening knowledge, accommodating varied shades of decisions and ideas. It also encompasses planned time allocated to class activities, extra-curricular activities, homeworks, engaged time, use of space such as laboratories, studios and science resources centres. In adaptation, the teacher changes or modifies the format of an existing material to meet instructional needs. Ekpo (2009) opined that reprinting of an already printed material, enlargement of another could be used in different ways under different conditions. These are regarded as forms adaptation.

Research-based curriculum innovativeness

Curriculum innovation should be based on research. Research on the adoption of innovativeness is largely hampered due to factors affecting immediate change with few studies focusing on enduring and lasting change. An enduring change in pedagogy based on the use of technology in science teaching within assigned classroom settings needs to be closely looked into. Dunn (2010) opined that research-based curriculum that is highly innovative is more likely to continue to demonstrate an ability to integrate technology use in the classroom at a high level than less innovative curriculum. Science activity-based skills can better be developed by this means. Science educators who have the ability to make enduring

changes in the integration of technology into classroom environment change lives for the better for lifelong learning. Curriculum planning should therefore tackle the problem of lack of indigenous research-based capacity and conduct basic and applied research in emerging areas of science and technology.

Policy development and practice for curriculum innovativeness

Policy development in curriculum innovativeness in science and technology is crucial if science is to play a meaningful role in improving educational standards. Not only does policy draw on research outcomes, but also on societal needs and values. Ajibola (2008) opined that experiences of educational reforms all over the world have shown that curriculum is at the same time a policy and a technical issue, a process and a product involving a wide range of institutions and actors. Consequently, policy support structures need to be in place to make curriculum innovation viable for science and technological skills acquisition and development. The Federal Government policy on education sets out clearly, what the basic philosophy, objectives and structure of science teaching should be. For example, the policy articulates the values that teachers should infuse into learners and spells out the objectives at each level of the educational system. UNICEF/NPF (2001) noted that policy is unequivocal in its stance on functional, universal and qualitative education being the objective of each country's educational endeavour. Policy development continuity is therefore an imperative towards curriculum innovativeness and teacher adaptation.

There is need to provide effective policy articulation that will deliver and regulate educational curriculum in all science subject contents. A home-grown policy on education focusing on relevant national goals and aspiration, formulating and fashioning new innovative contents for subjects should be the initiative taken to catch up with the dynamics of social change. Linking subject contents to the day-to-day activities that take place within the students environment must give value beyond the classroom. As Wasagu (2008) puts it, the lack of continuity in the implementation of educational policies and programmes due to the successive changes, resulted in instability in the institutional arrangement of the educational system at federal and state levels.

The gap between policy prescription and practical application has remained wide. There is insufficient political will to translate into reality the formal commitment to ensuring universal access to quality basic education (UNICEF/FEG 2001). It is important therefore to back up policy framework with adequate budgetary allocation to make room for the provision of sufficient classrooms, train enough teachers, pay adequate salaries and provide other inputs necessary for the realization of the country's educational goals.

Collaborative interaction for Nigerian indigenous science-technology content

Collaboration should be on to look into deficiencies in the curriculum and its delivery. Inadequate school infrastructure, overcrowded classrooms, weak motivation on the part of the teachers, stress of examination, planning, statistics, monitoring and evaluation in the education sector are some of the challenges facing curriculum innovation. Science and technology provides the organic link that connects education to a wide scope involving all sector of any economy. Science and technology role between communities in Nigeria is very low and also collaboration between communities and other nations will not only improve but empower learners to determined career paths, realize future aspirations and acquire knowledge for skills development. Abubakar (2010) maintained that the active integration of the national culture for science and engineering technology would facilitate economic growth driven by technological advancements. He opined that this collaboration would enhance scientific research and development that will adequately harness and utilize resources for African technology development for self-reliance. It is important that this vision be pursued

with pragmatic activities and knowledge to facilitate its inclusion in innovative curriculum planning for all levels of education. The immediate objective on this should bring together stakeholders from research institutes, universities, government establishments and the private sector to identify and promote strategies and procedures that will accelerate industrial links and productivity.

Teachers' quality for innovative adaptation

Teaching is a profession and teacher quality is vital for achieving competence in realizing innovative adaptation for learners needs. Teachers need enhanced strategies that will help in the development of education in line with modern trends in curriculum issues. Adequate mastery of innovative technologies for instruction is needed for proper handling of materials for content dissemination to learners. The teacher must be innovative and competent in the use of technologies in their areas of specialization for effective teaching. Creativity is another important skill that imparts on learners potentials for discovery. Asaju (2008) opined that creative teaching demands that the teacher understand his learners and his craft for him to always make the best of any teaching situation. He must be grounded in psychology of children to be able to reach out to them. Motivational skills is also a necessary ingredient that gives a driving force to learners. Teachers should be well trained for inculcating this skill in the students. Attaining best practices in learning outcomes depends to a great extent on the teachers' motivational ability.

Nigeria like most African countries is facing challenges in its various teacher development pursuits. One of the challenges is the training of competent teachers in adequate number for the available schools. Another is the challenge of the upgrading of teachers knowledge and skills. Most teachers are ignorant of curriculum changes talkless of its innovativeness. This is borne out of lack of knowledge of the available types of curriculum; hence, most science teachers are unable to meet up with global changing needs in teaching. One of the objectives of national policy on teacher education (NPE, 2004), state that, teacher education shall continue to take cognizance of change in methodology and in the curriculum; and that teachers shall be regularly exposed to innovations in their professions. A major indicator in quality teaching is quality pedagogy. Quality pedagogy enhances students' inquiry in learning. This can effectively be attained when the teacher updates knowledge that adapts to curriculum innovation. Training is therefore necessary. Teachers are challenged not to be left behind in the swirl of rapid technological change (UNESCO 2002). Teachers knowledge input that will best suit their training and help prepare them in adapting to curriculum changes for skill acquisition and creativity in teaching will be of great interest. Teacher quality will therefore enhance best practices needed for effective classroom lesson delivery and lifelong productivity.

Development and production of innovative instructional materials

Curriculum planners need to develop, design and produce innovative and appropriate instructional materials that are easily adaptable by teachers. These materials should be sourced from learners' environment with usable and functional equipment that are appropriate. Curriculum that develops its own pattern of education in conjunction with local needs is apt. Laboratories, workshops and studios that are functional should be tailored along practical and realizable tools of instructional materials that connect modern day appropriate technologies for teacher adaptation

Short and long term planning for curriculum innovativeness

Curriculum planners must appreciate that technology is a primary index of power and the foundation of all development. Any development without it ultimately collapses giving rise

to social upheavals. Science and technology goals should be strategized for short-term benefits with embedding innovations to meet the needs of national security, social stability, food security, wealth and job creation. It should be well articulated for learning and teachers adaptation. Long-term benefits should be for realizing enabling environments for meeting rapidly changing global business environment with human capital development.

Reasons for curriculum innovativeness and teacher adaptation in curriculum content and learning experiences

Culture dependence

Culture plays a great role in bringing education to its learners. Curriculum innovativeness should therefore identify and promote strategies that encompass positive cultural values that will stimulate interests of learners. Cultural values like craft, music, language and beliefs are needed to make learning relevant and permanent and enhance learners' enquiry for skills and knowledge acquisition.

Ikpomwusa in Okoroafor (1999) observed that African science does not mean there is no science in Africa, but that science must be programmed and explained as it relates to African culture. This provides a link as to how curriculum innovativeness should be channeled for effective science and technology knowledge of learners. Influence of culture on the learning of science for any nation therefore deserves greater attention.

Value promotion

Students and teachers contribute to curriculum innovation by bringing in ideas that promote learning needs and contribute to society's development. They do this by sharing knowledge that promote African values that help connect science-technology links to worldwide view. Curriculum innovativeness should therefore be consistent with value promotion in ensuring quality education. Home-grown value ideas for acceptable societal norms such as processing and packaging of local foods and seeds must meet international standards. They are needed in the curriculum for formulating and fashioning a new concept of promoting African values scientifically and technologically.

Intellectual exposure

Learners need to be adequately exposed to their learning environment. Different skills such as psychomotor, affective, analytical and cognitive ability skills are needed by learners for adapting to dynamic challenges for interaction. This will internalize learning perspectives for resource management and sustainable development. Intellectual exposure must give value beyond the classroom with an innovative curriculum.

Skill acquisition

The country's desire to achieve rapid, economic, scientific and technological development should lead to substantial restructuring of the curriculum with innovative ideas at all levels of education. It should start from a predominantly literacy type to one that stresses emphasis on skill acquisition through scientific and technological approaches. This is to catch up with the dynamics of social change for adaptation by teachers' and the changing demand for education.

Sustainability in nation building

Teachers with right ideas, skills and creativity for innovation are those who can lay a solid foundation for learners to transform society for national development. Creating curriculum for innovation will help teachers adapt to an atmosphere that is conducive for

teaching and learning. This will lay the appropriate means towards sustainability for nation building. Teachers who are flexible with changing dynamics intensify research efforts and ensure flexibility on innovativeness to meet changing societal needs.

Inculcation of Entrepreneurial and Technological Skills.

Entrepreneurial and technology skills are needed as knowledge-based ideas to empower learners acquire appropriate skills. Curriculum planning that is adaptable by teachers with modified innovations should be in place to ease learning. These should be the means of awakening learners' potentials for productivity.

Sensitization to learners' potentials

Curriculum innovativeness that encourages and initiate researches for promoting learners potentials should be in place. This will provide needed access for teachers' adaptation in promoting the utilization of natural resources that are appropriate to learning environments and their economic conditions. This will improve productivity that propagates results of scientific and technological researches. On this regards, learners' potentials are improved towards capacity building and productivity.

Problem militating against curriculum innovativeness and teacher adaptation:

Scarcity of knowledge of curriculum innovative resources.

The pathway to a nations' sustainability is through its human and material resources. Science and technology innovation is the engine of Nigeria's development. According to (Sirleaf, 2010) no country on earth has developed without deploying, harnessing and utilizing science and technology whether it is through technology transfer or home grown solutions. Nigeria lacks knowledge systems, knowledge communities and institutions that can harness and fully utilize its available resources for curriculum innovativeness. The mindsets of teachers are not adjusted to adaptation and so relevant learning resource and physical facilities have remained in the quagmire.

Indigenous resources not innovatively utilized

Every community has indigenous resources that could be incorporated for curriculum innovativeness, but these resources are not fully identified and utilized. Teachers are not skilful and creative in utilizing these resources for instruction. These indigenous resources include aesthetic parks, zoos, water fountains, libraries, museums, archeological sites, village settlements, farmlands, ecological habitats, historical and architectural sites. There is need to maximize these resources by teaching teachers by engaging childrens' minds to their uses and adaptation in the learning process. In adaptation, a teacher changes or modifies the format of existing material to meet instructional needs when indigenous materials are innovatively applied.

Poor training of teachers towards adaptation to curriculum innovativeness

Teachers are active creators of knowledge and are main instrument for change in any educational system. There is therefore need for teachers to be creative and innovative towards appropriate construction of desired knowledge. Teachers for instance, need to be properly trained and equipped for instructional delivery in this information age with its emerging new technologies by way of encouraging in-service training, workshop, seminars and conferences for those in the field already. Discussions on qualitative teacher training programmes for current issues in pedagogy and resource utilization adaptation are not priorities of educational institutions. The teacher and the kind of training he receives

particularly in the area of classroom teaching are of great importance in determining the quality of education learners are exposed to. Ekpo (2010) posits that Nigerian teachers are faced with the challenges of upgrading their skills and knowledge.

Teacher training should therefore be such that aims at producing qualitative teachers that can adapt to innovation in science and technology contents of the curriculum.

Inadequate curriculum innovativeness

Curriculum innovativeness involves curriculum content that has its value and quality viewed in the light of changes in a contemporary world. Adequate curriculum content and materials are yet to be put in place for teacher adaptation. There is a gap between what teachers work toward achieving in practice and what is expected of learning experiences. Majority of the teachers appear not prepared for new challenges and new roles that are apparent in a global dynamic world as ours.

Inadequate modern technologies in meeting curriculum innovativeness for changing educational needs

New technologies demanding expertise and professionalism that enable learners ability for accessing best brain material is yet to be in place in Nigeria schools. This hampers educational attainment for any nations' sustainability. ICT resources using multimedia interlink connection in laboratories, workshops and studios, field studies and research institutes are grossly inadequate. These facilities are ill-equipped or not given a facelift where they available for effective teacher adaptation and student knowledge and skill acquisition.

UNESCO(2002) emphasized that using ICT across the curriculum would enable students to have access to the best educational facilities necessary to prepare them to play full role in modern society and to contribute to a knowledge nation.

Conclusion

For curriculum innovativeness and teacher adaptation to be meaningful, all stakeholders in education should be involved in policy-decisions and implementations that provide insight into different aspects of curriculum planning on science and technology innovation for attainable national goals and entrepreneurial skill development of individuals.

Recommendations

For curriculum innovativeness and teacher adaptation to be effective, the following recommendations are made;

1. Federal, state, local governments and school administrators should evolve innovative curriculum that is environmentally and learner-friendly for ease of teachers' adaptation and appropriate knowledge impartation.
2. Experienced resource persons from other areas of the economy should be allowed to proffer suggestions on innovative curriculum that is workable and adaptable.
3. More research-based studies should be undertaken on innovative curricula resources to drive science and technology knowledge for ease of teacher adaptation in a changing dynamic world.
4. Locally sourced instructional resources for integrative curriculum innovativeness could be modified to facilitate experiential-engaging learning.
5. Curriculum contents should be reviewed periodically following global changing trends with strict adherence to educational policy developments.
6. Science laboratories in schools should be revamped to boost the mindset of students as this is a sure way to better living and productivity.

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