IDEAL INTERNATIONAL
JOURNAL OF IGBO SCHOLARS FORUM, NIGERIA
Vol. 12; No 1, March, 2019

Ideal International Journal
OF IGBO SCHOLARS FORUM, NIGERIA

Published by:

Printed by:
Besing Books Multipurpose Publications
No. 9 Wisdom Avenue
Suleja, Niger State
08060850177

Editor:
Onukwube Alex Alfred Anedo

CALL FOR PAPERS

IDEAL INTERNATIONAL JOURNAL OF IGBO SCHOLARS FORUM Nigeria calls for well researched papers from authors in areas that borders on Igbo in relation to other people's cultures. We welcome articles or proposals from all perspectives and on all subjects pertaining to Igbo, Nigerian, African people's and others' relations on Public policy, Language, Religion, Philosophy, Education, Medicine, History, Economy, Sociology, Culture, Engineering, Business relations, Comparative politics, strategy and environment, etc. Submit manuscripts as e-mail attachment to the Editorial Office at: igboscholarsforum@yahoo.com or send two hard copies of your papers to any of the editors. Referencing style is MLA or APA. The Journal wishes to publish the results of her researches annually.

Onukwube Alex A. Anedo
Editor
IGBO SCHOLARS FORUM NIGERIA
Department of African & Asian Studies,
Nnamdi Azikiwe University Awka,
Anambra State – Nigeria
Phone: +2348037859249, +2348149225739
e-mail:igboscholars@yahoo.com;
web: http://wwwigboscholarsforum.com.ng

Vol.12 No.1 March, 2019. ISSN: 2476-8421

FROM EDITORIAL DESK

Ideal International Journal is one of the brain children of Igbo Scholars Forum born out of the zeal to get the young Igbo scholars together so as to start thinking like Igbo sons and daughters through paper publications, meetings and symposia. As a matter of fact, Igbo Scholars Forum was founded by Dr. Onukwube Alexander Alfred Anedo and born at the launching of a festschrift in honour of their life patron, Prof. Obed Muojekwu Anizoba (Ozonwa) on the 15th day of December, 2012. In his kind gesture, Prof O. M. Anizoba therefore established a website http://www.igboscholarsforum.com.ng for them to use in telling the world who the Igbo people are, about their life, what they believe in and their relationship with people and other cultures of the world outside theirs. Other journal outlets through which this Forum wants to let Igbo people and their culture out to the world are Igboscholars International Journal and Ekwe International Journal which is solely written only in Igbo language.

Onukwube A. A. Anedo, Ph.D.

Table of Contents & Contributors **Pages**

Educational and curriculum changes in Sri Lanka: In Light of Literature

Fareed Mohamed Nawastheen
The Open University of Sri Lanka
fmnaw@ou.ac.lk

&

A.L.M.Riyal
almriyal@seu.ac.lk
South Eastern University of Sri Lanka

Abstract:
The purpose of this article is to explore the current educational practices of Sri Lanka and to review the curriculum changes over the years in the country. To achieve this purpose, a review of literature was conducted in order to reveal the current educational practices and curriculum changes in Sri Lanka. Main findings of the paper were that there were number of significant changes in the educational system from time to time, the intended goals of the changes had been failure due to lack of readiness of the stakeholders especially the teachers in the system. The aspects discussed in this paper would benefit the prospective researchers to get to know the educational practices of Sri Lanka and could compare the aspects with their own country.

Key words: Educational practices, Curriculum, Sri Lanka

Introduction

The Democratic Socialist Republic of Sri Lanka is an island and known as *Pearl* in the Indian Ocean. The total population of the country is 20.3 Million in 2012 (Department of Census and Statistics 2012). While the country has multi ethnic and religious groups, the Constitution of Republic of Sri Lanka has given foremost place to the religion of Buddhism. The paragraphs (1) and (3) of Article 15 (Government, Constitution of Republic Sri Lanka 1978; 2000) ensures the freedom and adequate protection for other religions. Sri Lanka census of 2012 shows composition of people in terms of ethnicity and religions. According to the census of 2012,

Buddhist represents 70.1%, Hindu 12.6%, Islam 9.7%, Roman Catholic 6.2%, and other Christian 1.4% out of the total population. Likewise, Sinhalese represented 74.9, Sri Lanka Moor 9.3%, Indian Tamil 4.1%, Sri Lanka Tamil 11.2%, Malay 0.2%, Burger 0.2% and others 0. 1%. The official languages of the country are Sinhala and Tamil and the English is the link language (Article No 18 of Constitution 1978; 2000). National languages are Sinhala and Tamil (Article No 19 of Constitution 1978; 2000).

Policy of Education

Sri Lanka has high education achievements and learning in South Asia region (De Mel 2007). Sri Lanka is highly acknowledged internationally for her achievements in literacy, educational enrolment and equal opportunity and access to education (Little 2010). This significant achievement in education was reached through endeavours and provisions for education especially free education for more than 60 years by the Governments after the independence of the country. Contemporary education policy of Sri Lanka is formulated by National Education Commission (NEC).

Free Education

Every citizen of the country is entitled to free education up to the university level. The free education has been provided for the past 60 years. C.W.W. Kannangara (1884-1969) was the first Minster of Education in the State Council of Ceylon. He introduced the Free Education Act in 1949 which enables access to free education for every child in the country. The policy of providing free education has been implemented from primary education to the university level. The policy of providing free education is practiced by the successive governments in the country till now (Arunatilake 2006; Little 1997; Jayaweera 1989). After independence, governments provide free text books and the meals for students. The successive governments of Sri Lanka continuously allocate money for free text books for the primary and secondary students and school uniforms to every student. According to the MOE (2008), the following welfare services also are provided by the government:

I. Free text books to all children up to Grade11.

II. A set of school uniforms given free annually.
III. Scholarship schemes which provide financial assistance to deserving children.
IV. Transport subsidies for travelling to school.
V. Free medical inspections in schools, provision of dental care and free spectacles to needy children.
VI. Supplementary feeding in identified schools where there are undernourished children in primary schools.
VII.

Compulsory Education

In addition to the free education, the compulsory education policy also contributed to the high achievements in education. Every citizen of the country has rights to access education and it is ensured by the constitution which is the supreme law of the country. Rights for education are ensured through the constitution of Democratic Socialist Republic of Sri Lanka. The Article No 27 (h) of the Constitution (1978; 2000) says "… the complete eradications of illiteracy and the assurance to all persons of the right to universal and equal access to education at all levels" is the fundamental duties of the Government of Sri Lanka. The general education of the country is governed by 72 years old education ordinance which has been amended from time to time. According to the NEC report (2009), the governing ordinance for education is as follows:

> "The provisions of the Education Ordinance No.31 of 1939 as amended by Ordinance Nos. 61 of 1939, 21 of 1945, 3 of 1946, 26 of 1947, Act No 5 of 1951, 43 of 1943, 37 of 1958 and law of No 35 of 1973 govern general education today" (NEC Report 2009)

In addition, there are some other related ordinances and amendments related to the general education that has been brought from time to time. The compulsory education for age group 5-14 has been enforced by the constitution (1978; 2000) and the Education Ordinance No 31 of 1938 for 5-14 age groups. Article No 22 (6) of the Constitution (1978; 2000) declared that:

"Every child between the ages of five and fourteen years shall have access to free education provided by the State"

In 1947, there was an amendment to increase the age limit for the compulsory education up to 16 years. NEC Reports (2003; 2009) stated that there were no proper mechanisms to ensure the enforcement of compulsory education until 1997. A monitoring strategy is introduced for ensuring compulsory education and school attendance of the school going age group by the Gazette notification No 1003/5 of 25 November 1997. Two committees: School Attendance Committee (SAC) for each *GramaNiladhari* Division and School Attendance Monitoring Committee (SAMC) for each Divisional Secretariat Division were constituted by the Ministry of Education. However Arunatilake (2006), Perera (2003) and Reports of NEC (2003) and (2009) revealed that activities of the committees were not satisfactory and dysfunctional by 2000. The enforcement of the compulsory education in the country has contributed to high levels of participation in school and the result is the high literacy rates in the country. However, it is proposed to extent maximum age of compulsory education till 18 years of old.

Medium of instruction

Providing education in local languages is another significant policy of education in Sri Lanka. The rights to get the education in their languages is legalised in the constitution of the country as stated in the Article No 46 (A) of the constitution (Government of Sri Lanka 1978; 2000): "A person shall be entitled to be educated through the medium of either Sinhala or Tamil and if facilities are available, through the medium of English". Little (1997) also noted the historical developments of medium of instruction in education as follows:

> Immediately after independence the medium of instruction in all government and government-aided schools began to switch from English to either Sinhala or Tamil. The process began in the first year of the primary cycle in 1948; in the first year of the secondary cycle in 1953; and in the first year of university arts courses in 1959. English-medium school examinations began to fade away in the 1960s, reinforcing the notion that all children, and not just among the elite, could reach the pinnacle of educational success (Little 1997:5)

Providing education in local languages helped the major ethnic groups Sinhala, Tamil and Moors to get the education at their own interests. Sinhala is the language of majority of the people and Tamil is the language of Sri Lanka Tamils and Indian Tamils as well as majority of the Moors (Muslims). The MOE (2008) states:

"Sinhala and Tamil are used as media of instruction in government schools. Normally, Sinhala children study in Sinhala medium and Tamil children study in Tamil medium. Muslim children study in either medium according to their choice. However, there are 437 schools teaching two or more subjects at least in one grade in the English medium. According to 2006 School Census 72.8% of the total student population study in the Sinhala medium while 26.1% and 1.1% study in Tamil and English media respectively. The number of schools is distributed evenly among the three media." (MOE 2008:8)

The Contemporary Structure of the Education System

The contemporary structure of education system is divided into six parts viz.: Pre School Education/ECCD, Primary Education, Junior Secondary Education, Senior Secondary Education, Collegiate Level and Tertiary Level. Report of National Education Commission (2003) categorized the structure of school based on the grade such as Primary grades 1-5 (Age 5-9), Junior Secondary Grades 6-9 (Age 10-13), and Senior Secondary Grades 10-13 (Age 14-16). Students sit for two national level exams namely GCE O/L (General Certificate Education Ordinary Level) and GCE A/L (General Certificate Education Advance Level) at the end of the senior secondary and collegiate level schooling respectively.

School System

According to the School Census (2017) contemporary school systems of the country consist of 10,194 government schools, 80 private schools, 26 special schools, 753 *Privenas* (Buddhist centres) and more than 265 international schools. The governments' schools are categorized based on the grades and streams. Senior Secondary School which has classes from grade 1 to 13 and all three streams called as 1AB schools. Similarly, Senior Secondary School has classes from grade 1 to 13 and having only Arts and commerce streams named as 1C Schools. Junior School which has classes from

grade 1 to grade 11 is called as Type II schools. Primary School which has classes from Grade 1 to 5 is called as Type III schools. In addition, there are National Schools which is directly governed by Ministry of Education whilst other schools are under Provincial councils of the country (MOE 2011 and NEC 2010:44). Though the schools are categorized for an easy administration purposes, existence of various types of schools also create complex and problematic situation in administration of the schools in the country (Ginige 2002).

Administration of Education System

The current education system in the country has a top down approach. The Ministry of Education of the central government is responsible for the entire management of the education system, however to a certain extent, functions of the central government have been devolved to the provincial councils with the 13th amendment to the constitution in 1987 (MOE, 2004). The devolution was made to ensure the provincial council's help to implement the policies of education at the grassroots levels. Provincial Ministries of Education, Provincial Departments of Education (PDEs) and Zonal education Offices (ZEOs) at district levels are other administrative bodies under the Ministry of Education for the management of the educational system (NEC 2009). It shows the centralized administrative hierarchical order in the education system in the country. Even though there are nine provincial education ministries, they are not powered to take policy decisions related to curriculum development and implementation. They help to implement the policies which are taken at the Ministry of Education. There are other institutions which are functioning under the Ministry of Education (MOE) in three categories namely; Departments, Statutory Boards and public enterprise (Oulai and de Costa 2009). National Education Commission (NEC), National Institute of Education (NIE), National Library and Documentation Service Board (NLDSB) and National Book Development Council of Sri Lanka (NBDC) are the Statutory Boards under MOE.

NEC and NIE are major statuary bodies which are closely working with MOE. While NEC serve as a policy advising agency, NIE on the other hand is solely responsible for the developmentand implementation of curriculum and conducting training for

personnels (Subject Directors, In-service Advisors and Resource Persons) from both the Provincial Department of Education Offices (PDE) as well as those from the Zonal Educational Offices (ZEO). PDE and ZEO assist the NIE in the implementation of the curriculum at the school levels. PDE office and ZEO office organizes training programmes for teachers. The procedures in terms of curriculum implementation obviously indicate that the educational system of the country has top down approach. In addition, Department of Examinations (DOE) and Department of Educational Publications (DEP) are functioning as departments under the Ministry of Education. Department of examinations is responsible for all public examinations for schools. It also conducts examinations for recruitments and promotions for other government agencies as well. Publishing all text books from Grade 1 to 11 and publishing other necessary supplementary books are handled by the Department of Educational Publications. National Education Commission takes care of the policy, planning and research. The National Institute of Education is responsible for developing school curriculum and conducting training programme for provincial and Zonal Directors and the resource persons.

Curriculum Development Process in Sri Lanka

The present education system has been influenced by the historical factors and the pressures from the global and local environment (NEC 2003). It is very useful to look back at the historical contributions for understanding the contemporary curriculum process. Contemporary education system and the curriculum development have been influenced by the factors of traditional, political, social, religious and economic development (Fernando et al. 2010). Civilizations and the cultures from the Indian subcontinent have been influenced in all aspects of the country throughout its history (Srisena 1969). It can be deduced that significant developments in the educational system of the country (Sri Lanka) is categorized into the following periods:

I. Pre-colonial Period
II. Colonial Period
III. After the independence

Curriculum in Pre-Colonial Period

Pre-colonial period covered the periods from the pre-Buddhist period in the country. It is believed there was no institutionalised curriculum in the country. There was a "*Guru Gedera"* education system in the ancient period. *Guru Gedera* system was where the students board with the teacher in his home and learn from him (Fernando et al. 2007). According to Fernando et al. (2007) the curriculum was in this period included necessary skill for war, for instance swordsmanship, art of war, horsemanship, stories about the heroes etc. with the introduction of Buddhism in the country, the curriculum was influenced by the Buddhist thoughts and practices. The *Guru Gedera* system was declined and Buddhist temples (*Vihara)* started to influence the education even though the education was not for all.Punch (2001) stated that the students from nobleman families and Buddhist priest were able to receive the education. The curriculum was Sinhala language, and fundamentals of Buddhist literatures (Punch 2001), Bali, Sanskrit and some other Indian languages (Fernando et al. 2007). At the same time, Tamils from the high caste families were able to receive education from the *Brahmins* in their temples (Punch 2001) and the curriculum was influenced by the Indian traditions.

Curriculum in Colonial Periods

There was colonial rule for more than 300 years in the country. Western education though started to flow into the country when the Portuguese captured the country in 1505 followed by the Dutch (1656) and British (1796) till 1948. Spreading the Christian religion through the educational system was the prime objective in the period of colonial rules. The missionaries such as Franciscan councils, Dominican council and Jesus council (Srisena 1969) established schools and taught religion based curriculum. The curriculum of this period included reading, religion, writing, songs, Latin and ethics (Srisena 1969, Fernando et al. 2007). Higher education was provided for only those who wanted to be priests. Jesus councillors introduced the education in three levels: primary, secondary and higher education (Srisena 1969).

The Dutch period in the country was from 1656 to 1796. Protestantism based curriculum was taught during the period. They included the subjects Sinhala, Tamil in the basic education.

Christianity, Dutch language, grammar, and composition, Greek, Hebrew and Theology were also taught (Fernando et al. 2007). They did not follow more vigorous policy on education like the Portuguese (MOE 2009) but had a firm policy on education (Srisena 1969). They established *Scholarchal* commission to monitor the schools (MOE 2009).They promoted reading abilities among the students because they believed that developing reading skills may contribute to disseminate the knowledge and religious thoughts (Srisena 1969).

Once the entire country was brought under British rule in 1815, a stable education system was established (MOE 2008, Punch 2001) and they made a greater influence in education (NEC 2009). The strategy of converting into Christianity through education was followed by the rulers in the early stage of British rule. It was changed in the later part of the periods. They introduced the same curriculum which was in their mother country. They had given more attention to English as medium of education but later they moved to the local language education (Punch 2001). Curriculum included the subjects such as History of England, Coal industry in England, Woollen industry and European classical literature There were significant changes brought in that period of 1931-1947 (MOE 2008).

The first Minister of Education in the State council (Little 2010) introduced mass reforms in the educational system. The curriculum was designed under the theme 3H's; "Head, Heart and Hand" (MOE 2008). An educational reform namely *Hendessa Educational System* (Fernando et al. 2007) was examined in the period of 1932. Curriculum was introduced with the objective of developing human resources. The time allocated was three hours in the practical session in the morning and two hours for theoretical understandings. The subjects such as health, local resources, local agriculture and industry, literature and music were included. This curriculum was aimed to train the students for real life situations than preparing for the general examination and was taught in rural schools. However, the curriculum reforms became inactive by 1945. At the same time, there was a comprehensive and activity-based curriculum implemented in the central colleges which offered higher education for students. However, this was also a failure (Fernando et al. 2007).

Curriculum in the Post-Independence Period

Curriculum development was carried under the Ministry of Education in the early years of post-independence period. Curriculum reforms were introduced in accordance with various White papers, Circulars and Reports of the commissions (Fernando et al. 2007). The curriculum development process was institutionalized after establishment of the Curriculum Development Centre (CDC) in 1960's. The significant achievement of CDC was the introduction of mega curriculum reforms in 1972 named as *Nawa Mega Reforms* (New mega reforms).

Curriculum Reforms in 1972- Nawa Mega Reforms

Sri Lanka for the first time in her history initiated educational reforms in 1972. The reform brought changes in both structure and content of the education (Fernando et al. 2007). The education structure was 5 +4+2+1 i.e. 5 years for primary education, 4 years for junior secondary education and 2 years for Senior Secondary and 1 Year for pre university education. At the end of 9 years of schooling, students sat for National Certificate of General Education Examination (NCGE). Based on their success in the examination, students continued 2 years of senior secondary education leading to the Higher National Certificate of Education Examination (HNCE). This was followed by year of schooling for selected students for the national universities. The content of primary education was Religion, First Language, Second Language, Mathematics, Physical and Aesthetic activities. The teaching methodology in primary was student centred (Fernando et al.2007). Junior secondary curriculum included 10 subjects: religion, first language, second language, new integrated mathematics, science, aesthetic, health and physical education, pre-vocational education-I, pre vocational education-II and third language.The education reform was continued for not more than five years (Little 2010). A number of factors contributed to failure of the educational reform of 1972. Some of the factors contributed to failure of education reforms were:

I. Highly developed scholastic curriculum that could not be afforded to the country

II. Teachers were not efficient in carrying out the subjects
III. Lack of physical and human resources
IV. Unpopular examination system
V. Create social class issues on selecting vocational subjects (Little 2010; Fernando et al. 2007)

Furthermore, a number of studies were carried out based on this educational reform of 1972. One of the important and early scientific literatures was the Science education in Malaysia and Sri Lanka of Lewin (1975). This study was carried out under the major research programme, "qualification and selection in educational systems" and it had been examined science curricula of both countries: Malaysia and Sri Lanka. Lewin (1975) argued that science courses in the developing countries rarely meet the criteria of relevance to the future lives of majority of students. He said the objectives of many new programmes that aim to promote the understanding and application of scientific principles are often undermined in the examination oriented atmosphere of the classroom which tends to favour the rote memorization of factual information. The study of the Lewin explored the inter-relations between policies to reform science curricula, and examination orientation and other factors which affect the successful introduction of innovatory courses. Further, it had been explored

i. nature and methods of curriculum development for future occupation and life styles, framework of classrooms and physical constraints of implemented curriculum in 1970's

John Oxenham (1975), noted about this paper that "… a feature of this study will be a detailed look at a particular innovatory course to examine the extent to which it has been successful in encouraging pupils to understand and apply scientific knowledge and, where it has not to establish factors which seem to be associated with this lack of success. Studies of Ranaweera (1976), Ariyadasa (1976) and Peiris (1976) were significant to understand the early stage of curriculum development process in the Sri Lanka. These were considered as some of the pioneer works in field of curriculum development and implementation in Sri Lanka. These papers described the different aspects of education and how they affected the educational reform. In some aspects of totally new

programmes, designed and developed, ground-up, were introduced; in others, the current programmes were reoriented with new emphases and focal points in the periods of 1972 in Sri Lanka.

Ranaweera's work on integrated science in the junior secondary school science in Sri Lanka one of the pioneer literatures in the field of curriculum development of Sri Lanka. This paper discussed firstly how science curriculum was in the periods of 1957-1972. He further discussed in his paper on topics such as why integrated science, objectives of the integrated science course, outline of four year course. His paper gave some useful reforms on 1972 curriculum reform and how science subjects in junior secondary school curriculum of 1972 were organised in the manner of integrated. Another series of paper which published same period (1976) was done by Ariyadasa (1976). His paper was on management of educational reform in Sri Lanka. In this paper, he discussed the overview of the educational reform of 1972, and some of the issues related managing curriculum reform of 1972. In the study of Peris (1976) on integrated approach to curriculum development in Primary Education in Sri Lanka, were some aspects discussed under the topics of important changes expected from new reform in primary education, how classrooms should be arranged and some of the qualitative development of 1972. This study was one of the evidences to show that child centred educational approach was tried for introduction into school curriculum in the 1970's period of time in Sri Lanka.

White paper 1981

One of the unfortunate scenes in education of the country is no stable policy on education. It has been changed from time to time with change of governments. The newly elected government in this period had brought a change in education through a White Paper. The curriculum reforms had taken place as per the report on Towards Reliance in Education 1979. The report was drafted by Education Reforms committee in this period. Government of the country in this period brought a white paper on education reforms entitled as education proposal for reforms. The white paper of 1981 had brought significant changes to education and the school curriculum. The reform was known as White paper on education

(Little 2010). The structure of education changed as 5+3+3+2 i.e. 5 years for primary, 3 years for junior secondary and 3 years for senior secondary and 2 years for pre university education. The life skills at junior secondary level and technical subjects at senior secondary level were replaced for the pre-vocational education I & II. The history and literature subjects were also introduced (Fernando et al.2007). The significant feature of the reform was the introduction of *Inter Alia* (cluster system of schools) – the system for sharing the resources within the cluster schools (Little 2010). According to Little (2010), the continuous assessment which was introduced in this reform was criticized by the teachers and parents and as well as some political parties. It survived only for one year. A very few studies were found for example Wanasinghe (Date unknown) and Wanasinghe (1981) who concerned about the curriculum reforms prior to 1980's. In these studies also more attention was given to 1972 curriculum reform.

Curriculum Reforms After 1990'S

One of the salient features of the curriculum development in Sri Lanka is that, it is developed in three folds. Report of NEC (2009) states this feature as follows:

> …three different types of curricula that are closely linked to one or more levels of the education system. These are the **integrated curriculum** at the primary level (grades 1 to 5), the **common and the balanced curriculum** at the Junior Secondary Level (grades 6 to 9) and the GCE/OL (grades 10 to 11), and the **specialization curriculum** at the GCE /AL (grades 12 to 13).

There were major curriculum reforms initiated in 1997 with the recommendations of National Education Commission. There were many factors that influenced education reform in 1990's. Youth unrest in two fronts in both communities was the major factor to consider change for the education system in the country (Little 2010). Government appointed Presidential Commission on Youth to explore the underlying reasons for the unrest among youth in the country. After several studies they found that one of the major reasons for that education system was appropriate for preparing youth for the world (Little 2010). In addition NEC (2003:16) states

that the report of the Youth Commission drew attention forcefully to this lack of continuity in the education policy.

In 1991, National Education Commission was established to recommend new policy on education and the commission released its first report in May 1992. The report included the recommendations on how the education and the curriculum should be framed. There were other documents such as Towards a National Education Policy, National Education Commission, (1993), An Action-Oriented Strategy towards a National Education Policy (1995), National Education Policy: a framework for action on general education, (1996), Reforms in Education (1997), General Education Reforms, 1997 the Presidential Task Force on General Education (1998) published which all insisted for urgent review on education reforms.

However, the opportunity had arisen in 1997 for educational reform with the newly elected government. The new government appointed a Presidential Task Force on General Education in 1996 (NEC 2003) with the twelve Technical Committee to implement the proposed policy. The president declared 1997 as the Year of Education Reform (Report on General Education Reforms 1997, NEC 2003).The reforms firstly implemented in Gampaha district at primary level in 1998 and later were introduced throughout the island in 1999 (NEC 2003). The reforms were introduced with two main objectives: Promoting access and equity in education and improving the quality of education. The NEC identified nine national goals for educational policy and set out basic competencies that should be achieved by each student through the general education.

- Curriculum of Primary education Child centred approach
- Integrated curriculum across four subject areas - language, maths, religions and environment-related activities
- Oral English introduced in Grades 1 and 2 for communication and formal English from Grade 3
- Organisation of curriculum in three key stages (KS): KS1 (Grades1-2);
  KS2 (Grades3-4); KS3 (Grade5)
- 3 teaching and learning processes, guided play, activity and desk work, with more play in KS1 and more desk work in KS3

- Identifying entry competencies to help teacher plan according to individual needs
- Identifying essential learning competencies for each KS, to be assessed at the end of each KS
- Class based assessment, school based management and continuous monitoring and supervision

Junior secondary education

- Curriculum changes in science and social studies
- Life competencies replaces life skills
- Activity rooms to be introduced and practical and technical skills emphasised
- Introduction of second national language

Strengthening of English programme

Senior secondary education

- G 10-11 identified as GCE O level grades instead of G 9-11
- Retention of 8 compulsory subjects with addition of technology to science and inclusion of literature as an option under aesthetic studies
- Addition of 7 optional subjects from which 2 is to be selected
- G12-13. Reduction from 4 to 3 subjects to be offered at GCE A Level
- Common general paper to be passed for admission to university
- Biology replaced botany and zoology; Combination of maths and higher maths replaced by pure and applied maths
- Practical components introduced to agriculture, and sciences and projects/assignments in other subjects with school based assessments
- General English made a compulsory subject in both G12 and G13
- Technology stream to be introduced geared to agriculture, industry and information sciences
- 80% compulsory attendance proposed
  Little (2010)

Several studies were carried out based on curriculum reforms of 1998. The study of Wijetunge and Rupasinge (2005) on The Senior Secondary School Curriculum (Grades 10-13) was aimed to assess the extent to which these changes have been effected in the senior secondary school curriculum in well-equipped as well as disadvantaged schools, to examine the impact of the reforms on (a) the quality of education and (b) access to alternate forms of higher education and to make suggestions for improvement in the provision and content of Senior Secondary Education. Methodology of this study was adapted in conducting the Situation Analysis. Some of the recommendations of the study were:

I. Reducing number of subjects from 4 to 3 at the Advance Level.
II. Introducing general subjects for all students such as GIT (General Information Technology) and General English at the Advance Level.
III. Introducing new technology stream at advance level parallel with Arts, Commerce and Science streams.

The study on Evaluation of the Effectiveness of the Implementation of Educational Reforms at Secondary Level (Grades 6-11) by Gunawardena et al. (2004) had nine objectives. The aim of the study was to assess the progress of implementation and achievements of objectives of the reforms. This study assessed several aspects of the curriculum reforms such as curricular materials, infrastructural facilities, instructional process, the qualifications and availability of teachers, implementation of school based assessment and supervision and monitoring of reforms implementation. The major findings of the study related to curricular materials were:

National goals no 2 and 9 have been given less attention in the curriculum.

National goals did not appear in some subjects (eg: Religion subjects).

Close connection between National goals and curriculum aims and objectives, between curriculum aims and objectives were not discerned in some subjects (eg: Life Competencies, Sinhala Language,

Tamil Language and English, Mathematics, Islam and Buddhism).

I. There was less horizontal integration among the subjects.
II. Vertical integration between the subjects was maintained.
III. Some subjects such as Buddhism, Hinduism and Life Competencies were found inappropriate to age level of students.

Gunawardena and Lekamge's (2004) study aimed to evaluate the implementation of the junior secondary curriculum in Kalutara and Ratnapura districts. It was based on the 1998 curriculum reforms and it presented some important recommendations.

I. Suggestion to improve newly introduced subject Life Competencies
II. Introducing science instead of environmental studies at grade 6.
III. Recommendations for teaching History and Geography separately rather than teaching under social studies as integrated subject
IV. Recommendations to strengthen second language subject in the curriculum

Little's (2010), study on the politics, policies and progress of basic education in Sri Lanka can be considered as one of the international literacy on the education of the country. In this exploration, she analysed how political factors influenced the changes of education in the country. Though she discussed in her monograph, about the historical changes especially after independence, she focused much on the 1997 curriculum reforms. The monograph explores the connections between the political and technical drivers and inhibitors of reform in practice and argues that low-level, as well as high-level political will, had played an active part in determining whether formulated policies are translated into action on the ground. Bi-partisan support for education policy is essential if implementation is to endure (Little, 2010).

Modernised Competency Based Curriculum Reforms 2007

NEC presented some recommendations in 2003 based on the above researches and other investigations carried by the institution. NEC (2003) revised the national goals which are mentioned in the earlier section of this paper. In addition, with the purpose of eight year cycle of curriculum and students readiness to face the 21st century challenges National Institute of Education brought another curriculum reforms in 2007 namely Modernized Competency based Curriculum. Gunawardena et al. (2010) states the new curriculum reforms in 2007 are based on some of the recommendations of the NEC the secondary education with the following objectives:

I. Encouraging activity based learning
II. Facilitating students in 'Constructive Knowledge'
III. Fostering the development of higher order academic abilities and skills and
IV. Providing for non-cognitive aspects of student development.

` The new curriculum reforms in 2007 mainly focused on secondary school curriculum and it can be considered as a continuity of previous curriculum reforms of 1998. The educational structure is retained as proposed as 5+4+2+2 in 1998. The curriculum reform 2007 have brought some salient changes in the school curriculum in terms of teaching competencies, changing roles of teachers, 5E as new instructional approach and new subjects and subjects classifications.

Though the curriculum reforms of 1998 contained the competencies, there were no proper methods adopted to teach the competencies. New curriculum reforms in 2007 have introduced methods to carry these competencies into the classrooms activities. Based on the basic competencies which were introduced by NEC, each subject prepared with overall competencies for the subject for the whole secondary school education and based on the competency levels planned in each subject at the grade levels. The competency levels have been organized horizontally through the subjects. The

competency levels for each subject are organized as subject dependent competencies and general competencies. Teachers are expected to carry the subject based competencies through their classroom activities. Ginige (2007) who headed this curriculum reforms, stated thus: "The competency-based curricula now developed on a series of subject dependent competencies that are subdivided into two or more competency levels, provides the main vehicle to realize the new curriculum vision, the content, at the heart of each competency level, confined to a few relevant topics and sub topics will certainly contribute to a reduction in the curriculum load."

In addition, new curriculum reforms also proposed 5E instructional method for teaching and learning activities. NIE prepared Teacher Instructional Manual for each subject and it included model lessons with the applications of 5E instructional approach. Teachers are required to develop their own activity plans for developing competency levels through the lessons and applications of 5E instructional approach in the classrooms. Teachers should be given more attention to develop student competencies through "exploration" by students (NIE 2009).

To realize the intended goal of the modernized competency based curriculum reforms, it further emphasized on roles of teachers in the classrooms. The reform suggested that teachers should change their role as transformational in the classroom learning and teaching activities. In the new dimension of the role of teachers, they are expected to become resource persons and facilitators. (NIE 2009).

Further, Number of new subjects is introduced in the curriculum reforms. The subjects:

First language (Sinhala/Tamil), Second Language (Sinhala/Tamil), Religion (Buddhism/Hindu/Islam/Christianity…etc.), English, Mathematics, Science, History, Geography, Life Competencies and Civic Education and Health & Physical Education as compulsory are taught at the junior secondary (Grades 6-9) students. Students at this level can choose two additional subjects from the subjects such as Art, Dancing, Drama & Theatre Arts, Oriental Music and Practical & Technical Skills are optional subjects for Grades 6-9. In addition, the new way of subject order (basket system) has been introduced at the senior secondary level (Grade 10 and 11).

Students are taught with 10 subjects at this level. Six subjects such as First language (Sinhala/Tamil), Religion (Buddhism/Hindu/ Islam/Christianity…etc.), English, Mathematics, Science and History are introduced as core subjects. And students are required to choose other four subjects based on their interest, from the three subject baskets which are included with various subjects of Art and Commerce, Aesthetic and Technical fields. Nevertheless, the new subject selection at Grades 10 and 11 was questioned by many and criticized. It was criticized that the new subject organization is irrational and do not help to the balanced personality of students (NEC 2009).

In addition, a few studies related to the 2007 curriculum reforms were available (Gunawardena et al. 2010 a, Gunawardena et al. 2010 b, Perera 2008 & 2008). Gunawardena et al. (2010 a) examined the degree of horizontal integration of the modernized curriculum introduced at secondary level (Grade 6-11) since 2007 while Gunawerdena et al. (2010 b) worked on a study to examine the degree of horizontal integration of the modernized curriculum introduced at secondary level (grade 6-11) since 2007 and examined the degree of vertical integration of the modernized curriculum introduced at secondary level (grade 6-11) since 2007.

Perera (2008; 2009) carried out on evaluation of the process of development and implementation of new curriculum in 2008 and 2009. Both studies were formative evaluation of the curriculum reforms of 2007 and evaluated just immediately of implementing reforms. The aims of the two studies were same but focused on different grades. Major objective of the studies was to assess the nature of curriculum development and implementation process in relation to Grades 6 & 10 and 7 & 11. Under this major objective, of the studies attempted to evaluate the curriculum development and reform at four bases such as curriculum development beginning, planning process of curriculum development, examine stage of curriculum development and how far the curriculum implementation process has been successful. The scope of the studies was broader and attempted to examine many variables in the systems. Perera's (2009) study on an evaluation of the process of development and implementation of the new curriculum in grades 7 and 11, aimed to assess the nature of curriculum development and implementation

process in relation to Grades 7 and 11. The findings of this study were illustrated in this study as follows:

I. The 5E model is less accepted by stakeholders. In designing learning events, a more suitable format has to be used.
II. The awareness programmes have not been efficient enough. Use of an accepted model to evaluate the programmes is necessary
III. There is mismatch between curriculum objectives and centrally controlled examination system. An authentic assessment programme has to be implemented.
IV. Before implementation at national level, the curriculum has not been pre-tested and a formative evaluation process at all stages is essential.

Perera's another study (2008) was an evaluation of the curriculum introduced to Grades 6 and 10 in 2007. It concluded that

I. The new curriculum was not founded on a clear theoretical base and had not been guided by findings of empirical studies. It was seen as a further step in the educational reform process initiated in 1997.
II. Existing curriculum had not been able to fulfil the student or social expectations due to heavy academic bias, excessive examination domination and lack of relevance to the needs of changing world.
III. Even though the existing curriculum had raised concerns among various stakeholders due to inability to achieve national general objectives and develop general competencies, no formal collection of information or studies had been done on the need to re-design the curriculum.
IV. No attempt had been made to gain insights from other countries to address shortcomings in the curriculum. There was a lack of consensus regarding the appropriateness of the 5 method.
V. Identified shortcomings in the existing curriculum had not been prioritized nor had what needs to be prioritized in the new educational reforms been identified.

VI. The development of a competency based curriculum had been initiated.

VII. Curriculum developers had separated some of the integrated subjects according to the current needs. An attempt has been made to plan the curriculum relevant for student by including information relevant for students' day to day life.

VIII. An attempt has been made to sustain the vertical integration in the curriculum. Yet learning activities to ensure horizontal integration of different subjects taught in the same grade has not been identified.

IX. The formative assessment process is being sufficiently carried out.

X. An effort has been made to plan learning activities to suit students as identified n psychological foundations.

XI. No pre-testing of educational learning materials has been done.

XII. No formal procedures had been in place to identify shortcomings in formative evaluation.

XIII. No plan to modify learning materials as necessary was visible.

In addition, studies of Sharifah Nor & Nawastheen (2013; 2014), Nawastheen et al. (2014), and Nawastheen and Sharifah Nor (2016) also revealed that the teachers concern themselves towards new innovations and usage of new innovation of the modernized curriculum reforms in Sri Lanka. In these studies, it was found that though the teachers' concerns towards new innovation of the curriculum changes were high but the actual usage of the innovation at the classroom level is very low. This clearly shows that the teachers were reluctant to change towards innovations of the curriculum.

Conclusion

Even though Sri Lanka is a developing country, it has the highest achievements in education. This paper talked about the geography of Sri Lanka briefly followed by discussion on policy of education as well as present educational system of the country.

Historical developments in the education and curriculum of the country were discussed briefly. Discussions on curriculum reforms particularly in the periods of 1972, 1998 and 2007 were also presented in this paper. In addition a number of studies related to the curriculum reforms of the country were examined in this paper.

References

Ariyadasa, K. D . 1976. Management of Educational Reforms in Sri Lanka. Paris: UNESCO Press.

Ariyadasa, K.D. 1976. Management of educational reform in Sri Lanka. In *Experiments and Innovations in education 25*. Paris: UNESCO.

Arunatilake, Nisha. 2006. Education participation in Sri Lanka—Why all are not in school. *International Journal of Educational Research 45 (2006) 137–152* 45:137-152 Online: http://www.sciencedirect.com/science/article/pii/S0883035506001224 Access on 19.11.2011.

Chandra, Gunawardane, Swarna Wijetunga, and Lal Perera. 2004. Evaluation of the effectiveness of the implementation of Educational Reforms at Secondary School Level (Grades 6-11). Sri Lanka: National Education Commission.

Department, of Census and Statistics. 2001. Census of Population and Housing 2001. Colombo, Sri Lanka: Department of Census and Statistics, Access online http://www.statistics.gov.lk/PopHouSat/Pop_Chra.asp 24.09.2011.

De-Mel, Tara. 2007. Stop tinkering with our education. *The Sunday Times Online: Vol 42, No 27,Wijeya News Papers Ltd. Colombo*.

Fareed Mohamed Nawastheen, Sharifah Nor Puteh, Mohamed Meerah, Datuk Prof Tamby Subahan, 2014. Evaluating geography teachers concerns towards the 5E instructional model in the competency based curriculum reforms of Sri Lanka, PhD Thesis, Universiti Kebangsaan Malaysia.

Fernando, T S, Sylvi Senadheera, G L S Senaratne, and T S V De Zoysa. 2007. *Curriculum Theory and Practice: Module II*.

Nawala: Faculty of Education, Open University of Sri Lanka.
Ginige, I L. 2008. *Competency based curriculum and activity plans.* Maharagama: Center for Education Competency Development, Sri Lanka.
Ginige, Indira Lilamani. 2002. Education Research for Policy and Practice: Secondary Education Reforms in Sri Lanka. *Educational Research for Policy and Practice* 1:65-77 Online: http://www.springerlink.com/content/n311651205065134/fulltext.pdf
Ginige, Indira Lilamani. 2007. Curriculum reforms 2007 to address issues in school education. *Daily News: http://www.dailynews.lk/2007/08/22/fea03.asp*.
Government, The Demorgratic Socialist Republic of Sri Lanka. 1978 (2000). The Constitution of The Democratic Socialist Republic of Sri Lanka The Demorgratic Socialist Republic of Sri Lanka: Online: http://www.priu.gov.lk/Cons/1978Constitution/Introduction.htm Access on 18.11.2011.
Gunawardena, Chandra. 2010 Education for holistic development. Paper read at Annual Academic Sessions of Faculty of Education, 3 Feb 2010, at Open University of Sri Lanka.
Gunawardena, Chandra. 2010 (B). A Study to Examine the Degree of Horizontal Integration of the Modernized Curriculum Introduced at Secondary Level (Grade 6-11) since 2007, National Institute of Education.
Gunawardena, Chandra, and Fernando T.S. 2005. Open University's Contribution To Improving The Quality Of Primary And Secondary Schooling In Sri Lanka. *Retrived from http://www.col.org/forum/PCFpapers/Gunawardena1.pdf on 06.10.2013*.
Gunawardena, Chandra, and Dayalatha Lekamge. 2004. Evaluvation of the junior secondary curriculum in selected districts of Kalutara and Ratnapura National Education Commission, Colombo.
Gunawerdena, Chandra. 2010 (A). A Study to Examine the Degree of Verticle Integration of the Modernized Curriculum

Introduced at Secondary Level (Grade 6-11) since 2007. National Institute of Education.

Jayaweera, S. 1989. Extension of educational opportunity—the unfinished task. In *the C.W.W. Kannangara Memorial Lecture* . National Institute of Education 13 October.

Lewin, K. 1975. *Science Education in Malaysia and Sri Lanka, IDS Discussion Paper no.74*.

Little, Angela W. 1997. The Value of Examination Success in Sri Lanka 1971-1996: the effects of ethnicity, political patronage and youth insurgency, *Assessment in Education: Principles, Policy & Practice* 4 (1):67-86 Online : http://dx.doi.org/10.1080/0969594970040105, Access on 19.11.2011.

Little, Angela W. 2010. The Politics, Policies and Progress of Basic Education in Sri Lanka. CREATE, Centre for International Education.

Little, Angela W. 2010. The politics, Policies, and Progress of basic education in Sri Lanka. Paper read at Research on Educational Access, Transitions and Equity.

Ministry of Education, 2006. School Census - 2006-Preliminary Report. Colombo, Online: http://www.statistics.gov.lk/education/SUMMARY%20TABLES%202006.pdf.

Ministry of Education, MOE. 2004. The Development of Education: National Report. Ministry of Education, Online: http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/srilanka.pdf Access on 17.11.2011.

Ministry of Education, MOE. 2008. Education For All: Mid Decade Assessment Report Sri Lanka. edited by E. f. A. Unit: Ministry of Education.

Ministry of Education, MOE. 2012. Sri Lanka Education Information 2012. Isurupaya, Battaramulla Data Management Branch, Ministry of Education, Accessed online: http://www.moe.gov.lk/web/images/stories/statistic/sl_edu_info_2012.pdf.

National Education Commission,. 1992. Sessional Paper No V-1992: The first report of the National Education Commission. Nugegoda: NEC, Sri Lanka.

National, Education Commission. 2010. Towards a New Education Act for General Education in Sri Lanka.: National Education Commission.
National Institute of Education, NIE. 2007. Syllabus for Geography-Grade 6: http://www.nie.sch.lk/ebook/e6syl12.pdf access 16.11.2011
National Institute of Education, NIE. 2008. Teacher Instructional Manual: Geography-Grade11. edited by D. o. S. Sciences. Maharagama: National Institute of Education.
National Institute of Education, NIE. 2009. Teachers Instrutional Manual- English subject: Grade 9. edited by D. o. E. Language. Maharagama: National Institute of Education.
Nawastheen, Fareed Mohamed, and Nor Puteh Sharifah. 2012. Teachers' Concerns in the Implementation of 5E Instructional Model in Sri Lanka. Paper read at The 3rd International Conference on Learner Diversity, at Universiti Kebangsaan Malaysia (UKM).
Nawastheen, Fareed Mohamed, Sharifah Nor Puteh, and Mohamed Meerah Tamby Subahan. 2013. Teachers' Levels of Use of the 5E Instructional Model in the Implementation of Curriculum Reforms in Sri Lanka. Paper read at 6th International Seminar on Regional Education UKM-UR2013, 22 & 23 May 2013, at Dewan Rafflesia, NIOSH, Bandar Baru Bangi, Selangor.
Nawastheen, Fareed Mohamed, Sharifah Nor Puteh, and Mohamed Meerah Tamby Subahan. 2014. Teachers' Levels of Use of the 5E Instructional Model in the Implementation of Curriculum Reforms in Sri Lanka. Research Journal of Applied Sciences, Engineering and Technology Vol 7(17) P 3561-3570, Maxwell Science Publication
Nawastheen, Fareed Mohamed and Sharifah Nor Puteh. 2016. Teachers' Innovation Configuration of 5E Model in the Implementation of Competency Based Curriculum Reforms in Sri Lanka. Paper read at The 7th UPSI-UPI International Conference in Education, At Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak, Malaysia.
NEC, National Education Commission. 2003. Envisioning Education for Human Development: Proposal for a National Policy Framework on General Education in Sri

Lanka. Nugegoda, Sri Lanka: National Education Commission.
NEC, National Education Commission, Ministry of Education and Higher Education, and National Institute of Education. 1999. Workplan for New Education Reforms: Secondary Education. Nugegoda Sri Lanka.
Oulai, Dramane, and Isabel da Costa. 2009. Education budgeting in Bangladesh, Nepal and Sri Lanka: Resource management for prioritization and control. UNESCO: International Institute for Educational Planning, Online: http://unesdoc.unesco.org/images/0018/001871/187180e.pdf.
Peiris, K. 1976. Integrated approach to curriculum development in primary education in Sri Lanka. In *Experiments an innovations in education 26*. Paris: UNESCO.
Perera, G. M. T. N. 2008. An Evaluation of the Process of Development and Implementation of the New Curriculum in Grades 6 and 10. Maharagama: Department of Research,Faculty of Research and Development,National Institute of Education, Sri Lanka.
Perera, G.M.T.N. 2008. An Evaluation of Process of Development and Implementation of the New Curriculum in Grades 6 and 10. National Institute of Education.
Perera, G.M.T.N. 2009. An evaluation of the process of development and implementation of the new curriculum in grades 7 and 11. National Institute of Education.
Perera, S. 2003. Sri Lanka Education System as a Reflection of Society's Reptures: A Conceptual and Theoratical Exploration. Maharagama: National Institute of Education, Sri Lanka.
Perera, W S. 2003. Implementation of Compulsory Education Legislation. National Institute of Education.
Punch, Laxman. 2001. Resistance Towards the Language of Globalisation – The Case of Sri Lanka. *International Review of Education* 47 (3-4):361-378 Online: http://www.springerlink.com/content/p537713453014426/fulltext.pdf ,Access on 19.11.2011.
Ranaweera, A.M. 1976. Integrated science in the junior secondary school in Sri Lanka. In *Experiments and innovations in*

education No 27, An International Bureau of Education series. Paris: UNESCO.

Sharifah, Puteh Nor, and Fareed Mohamed Nawastheen. 2013. An Evaluation on the Implementation of 5E Instructional Model in Teaching Geography in Sri Lanka. *Middle-East Journal of Scientific Research* 16 (5):721-728.

Srisena, U.T.I. 1969. Introduction In *Education in Ceylon: A hundres year celebraties magazines (Sinhala and Tamil)*, edited by U. T. I. Srisena. Colombo, Sri Lanka: Ministry of Education and Cultural affairs.

Statistics-SriLanka, Department of Census and. 2001. Census of Popualtion and Housing. Colombo: Department of Census and Statistics: Online http://www.statistics.gov.lk/PopHouSat/Pop_Chra.asp acces on 18.11.2011.

Wanasinghe, J. 1998. Are the educational reforms on the right track. *The Island 27.09.1998*.

Wanasinghe, Jayampati. 1982. Innovations in Educational Assessment with Special Reference To Educational Reforms introduced at the Junior Secondary Level in Sri Lanka In 1972. *International Journal of Educational Development Year:1982* 2 (2):141-152.

Wanasinghe, Jayampati. 1982. A critical examination of the failure of the junior secondary school curriculum and prevocational studies in Sri Lanka. *International Journal of Educational Development* 2 (1):61-71.

Wanasinghe, Jayampati. 1983. The concept of cluster schools and its relevance to educational development in Sri Lanka. *International Journal of Educational Development* 3 (3):247-252.

Wijetunge, Swarna, and Rupasinghe. 2005. The Senior Secondary School Curriculum (Grades 10-13). National Education Commission.

An Investigation into the Impact of Application of Mathematics in Entrepreneurial Skills Development

BY

Menkiti Chika Cordelia
Department of Mathematics,
Nwafor Orizu College of Education
Nsugbe
+2347039880920fvaamd@gmail.com

and
Uwandu Simon Onyinyechukwu
Department of Mathematics
Professor Enoch Anyankwu Christ Education College ,
Owerri Imo State
+2347033572474 simononyinyel@gmail.com

Abstract
This study focused on the impact of the application of mathematics in entrepreneurial skill development The study was conducted in in Idemili North Local government Area Anambra State. Mostly people in Idemili North Local Government Area are known for their engagement with small and large skilled business for earning a living. A survey research design was used for the study .The Taro Yamane formula was used to select a sample of four hundred (400) entrepreneur from major commercial towns in the Local Government Area. The instrument of study was Ten (10) items structured questionnaire .The instrument was validated by two lecturers from mathematics department and measurement and evaluation unit of psychology department of Nwafor Orizu College of Education, Nsugbe. The reliability was established using Pearson Product Moment Correlation Coefficient(r) and a value of 0.85was obtained which was considered high enough. Three (3) research questions and two (2) research hypotheses were formulated to guide the study. The research questions were analyzed using percentages(%)and the research hypothesis was tested using Chi-square(X^2) statistic at 0.05 level of significance. In light of the

findings, recommendations were made that application of mathematics in entrepreneurial development studies essential for rapid and sustainable economic growth and development; reduction in unemployment and poverty.

Keywords: Mathematics, Entrepreneur.

Introduction

An entrepreneur is a person with foresight, far sight; mind sight and insight into business ventures (Igbongidi, 2010). Entrepreneur is person who discovers new method and new market of production. This means that an entrepreneur takes calculated risks, enjoys business challenges and sees these challenges as stepping stones toward success.

Entrepreneur refers to as people that have willingness to take risks while others stand to talk, identify opportunities to which others are blind and develop optimum confidence in themselves well beyond that of others. It is also described with the following attributes: go-getter, business superstar, dreamer, visionary, innovation, inventor, creator, translator, achiever, Seer risks taken identifier, building promoter, initiator, and mentor (Igbonigidi, 2010).

Entrepreneurs are frequently thought of as national assets to be cultivated, motivated and remunerated to the grated possible content. They also change the way we live and work. If successful their innovations may improve our standard of living. In short, in addition to creating wealth from their entrepreneurial ventures, they create jobs and better the conditions for a prosperous society. Furthermore, entrepreneurs create Social Changes through their unique offerings of new goods and services by break away from tradition, indirectly supporting freedom and reducing dependence on obsolete systems and technologies. They also help in Community Development by investing in community projects and provide financial support to local communities. They Add to National Income through their ventures which literally generate new wealth. The act of being an entrepreneur is known as entrepreneurship. No one can succeed in entrepreneurship through sheer luck except

through creative ideas, extensive research work, plenty of trials doggedness, innovative ideas, precise decision making, accurate problem solving, good managerial ideas and consistent persistence and consistent persistence efforts. All these which can build entrepreneurship activities successful can be provided through the knowledge of Mathematics. (Odumosu &Olusesan, 2016)

Mathematics is a serving subject to all field of endeavor. The importance of this servicing subject to individuals, artisans, traders, school subjects, economic activities, political development, business advancement, technological knowhow and so on cannot be over-emphasized.

Mathematics Application on Entrepreneurial Development skills

1. HAIR DRESSING: It is a salon where you can make hair or cut hair to look more attractive. The area of Mathematics applied are: proportion, geometry, construction
2. BEAD DRESSING: It is art of forming or attaching beads to one another by stringing them with a sewing needle or beading needle and thread or thin wire for cloths, jewelry, shoes, bags, etc
   The areas of Mathematics applied are: Probability, Proportion, and Geometry.
3. DECORATION: It sis the art of making something or place to look more attractive on special occasion like house, church, funeral seasonal decoration etc.
   The areas of Mathematics applied are: Geometry, Statistics, Linear equation, Simple proportion.
4. ARTS: It is a person engaged in one or more of any of as broad spectrum of activities related to creating art, practicing the arts and demonstrating on art.
   The areas of Mathematics applied are: Geometry, Trigonometry.
5. ANIMAL HUSBANDRY: It is the management and care of farms animals by humans in which genetic qualities and behaviour considered to be advantageous to humans and further developed.

The area of Mathematics applied are:: Statistic, Ratio, Percentage.

6. VULCANIZE: Is a process of Harding rubber by treating it with sulphur at a high temperature.
   The area of Mathematics applied are:: Dynamics. Statistics.
7. CARPENTERS: Is a person who makes wooden objects and structures.
   The areas of Mathematics applied are: Geometry, Statistics.
8. CATERING: Is the process of preparing, preserving, and providing of foods and drinks for meeting or ceremonies or social events.
   The areas of Mathematics applied are: Statistics, Measurement, and Proportion.
9. HOUSEHOLD: Is anything being produce for the use or consumption of the family members.
   The area of Mathematics applied are:: Statistics, Geometry, Trigonometry.
10. DRIVING: Is the process of operating and controlling the direction and speed of a motor vehicle.
    The areas of Mathematics applied are: Dynamics. Proportion; Rate.
11. ICT/SYSTEM REPAIR: Is the process of restoring a good condition of a system, or ICT or GSM.
    The areas of Mathematics applied are: Integration, Calculus, and Dynamics.
12. EVENT PLANNING: Is the process of managing a project such as meeting, convention, trade show, ceremony, team building activity, party. The area of Mathematics applied are:: Statistics, Simple Arithmetic, Probability.
13. WEB DESIGNER: It is planning, creating, updating of websites.
    The areas of Mathematics applied are: Proportion, Ratio
14. DIGITAL PRINTING:Is the process of transferring a document on a personal computer or other digital storage device to a printing substrate by means of a device that accepts text and graphic output.
    The area of Mathematics applied are:: Geometry, Algebra Formulas, Angles, Fractions, Circle Areas, Percentage.

15. PHOTOGRAPH: It is the science of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor or chemically by means of light sensitive materials such as photographic firm.
    The areas of Mathematics applied are: Geometry, Fraction, Angles, and Percentage.
16. INTERNET: Is an international information network that is linking computers.
    The areas of Mathematics applied are: Geometry, Calculus, and Dynamics.
17. Local area network (LAN): Is a computer network that links devices within building or group of adjacent buildings.
    The areas of Mathematics applied are: Geometry, Probability, Proportion, Trigonometry, and Dynamics.
18. SOAP MAKING: Is the process producing soap for personal and commercial use.
    The area of Mathematics applied are:: Statistics and Dynamics, Geometry.
19. PERFUME: It is a sweet –smell liquid for applying in the today.
    The area of Mathematics applied are:: Statistics and Dynamics.
20. Air FRESHER: is a product designed to mask or remove unpleasant odor in the rest rooms.
    The area of Mathematics applied are:: Static, Dynamic, Geometry.
    Source: Shelby L. Brumelle (1939 – 2001) and Sonoike (2006)

Statement of Problem

Unemployment is an issue which is geometrically increasing globally. Entrepreneur skills development has recently become the solution to the agitation towards the reduction of unemployment in Nigeria. The Entrepreneur skills development requires the knowledge of mathematics. This

study sought to investigate the impact of application of mathematics in entrepreneurial development skills.

Purpose of study

Specifically the study sought to find out:

1. Whether the application of Mathematics contribute to the development of an entrepreneurial skill.
2. The extent to which the level of mathematics knowledge acquired by male have influence on their success in entrepreneurial skills development.
3. the extent to which the level of mathematics knowledge acquired by female have influence on their success in entrepreneurial skill development.

Research Questions

The following research questions were raised to guide the study

1. To what extent does the application of mathematics contribute to the development of entrepreneurial skills?
2. To what extent do the level of mathematics knowledge acquired by male have influence on their success in entrepreneurial skills development?.
3. The level of mathematics knowledge acquired by male and female does not have influence on their success in entrepreneurial skills development?

Research Hypothesis

The following null hypothesis guided the study

H_O: There is no significant differences between the influence of the level of mathematics knowledge acquired by male on their success in entrepreneurial skills development and the influence of the level of mathematics knowledge acquired by female on their success in entrepreneurial skills development

Research method

Survey research design was adopted for the study. The population of the study comprises of all entrepreneurs based in Idemmili North Local Government Area .A sample size of four hundred (400) entrepreneurs was selected using Taro Yamane formula for determining sample size from the major commercial towns in the Local Government Area. A Ten (10)-item structured questionnaire was formulated to guide the study. The instrument was validated by two lecturers from mathematics department and measurement and evaluation unit of psychology department of Nwafor Orizu College of Education, Nsugbe. The reliability was established using Pearson Product Moment Correlation Coefficient and a value of 0.85was obtained which was considered high enough. Three (3) research questions and one research hypothesis were formulated to guide the study. The research questions were analyzed using mean and the research hypotheses was tested using Chi –square (X^2) at 0.05 level of significance.

Results

Research Question 1: To what extent does the application of mathematics contribute to the development of an entrepreneurial skill?

Table 1: Mean response on the application of mathematics contribution to the development of an entrepreneur skills

S/NO.	Items	Agreed	Disagree
1.	Development of entrepreneurial skills need knowledge of Mathematics	250(62.5%)	150(37.5%)
2.	Good Mathematics students do well in entrepreneurial skills acquisition.	300(75%)	100(25%)
3.	Without the knowledge of	280(70%)	120(30%)

	MathematicsI cannot do well in entrepreneurial skills acquisition		
4.	Entrepreneurial skills can be developed without the application of Mathematics.	100(25%)	300(75%)
5.	Mathematics knowledge when applied in my entrepreneur skills will not help to maximize profit	100(25%)	300(75%)

Table1 shows 62.5% of the respondents agreed that the development of entrepreneurial skills need knowledge of Mathematics. Interestingly 75% agreed that good Mathematics students do well in entrepreneurial skills acquisition,70% agreed that without the knowledge of Mathematics entrepreneurs cannot do well in entrepreneurial skills development,75% agreed that entrepreneurial skills cannot be developed without the application of Mathematics .Also 75% disagree that Mathematics knowledge when applied in entrepreneur skills will not help to maximize profit.

Research Question 2: To what extent does the level of mathematics knowledge acquired by male have influence on their success in entrepreneurial skills development?

Table 2: Male mean ratings on the level of acquisition of mathematics knowledge influence on their success in entrepreneurial skill development

S/N	Items	Agree	Disagree
1	Mathematics can be applied at all level of any entrepreneurial skills development.	100(50%)	100(50%)
2	the level of the application of mathematics knowledge influences entrepreneurial skill acquisition	150(75%)	50(25%)
3	Teaching of entrepreneurial skills need adequate basic	130(65%)	70 (35%)

	knowledge of mathematics		
4	Knowledge of Mathematics helps entrepreneur ,towards increasing their daily income.	40(20%)	160(80%)
5	The knowledge of Mathematics iimproves the managerial skills of the entrepreneur in their everyday life.	75(37.5%)	125(62.5%)

Table 2 shows that 50%of male respondents agreed and disagreed that Mathematics can be applied at all level of any entrepreneurial skills development. 75% of male respondent agreed that the level of the application of mathematics knowledge influences entrepreneurial skill acquisition. 65% of the male entrepreneurial skill instructors agreed that teaching of entrepreneurial skills need adequate basic knowledge of mathematics. 80% of male respondent disagreed that the knowledge of Mathematics helps entrepreneur, towards increasing their daily income.62.5% of male respondent agreed that the knowledge of Mathematics improves the managerial skills of the entrepreneur in their everyday life.

Research Question 3: To what extent do the level of mathematics knowledge acquired by female have influence on their success in entrepreneurial skill development ?.

Table 3: Female mean ratings on the level of acquisition of mathematics knowledge influence on their success in entrepreneurial skill development

S/N	Items	Agree	Disagree
1	Mathematics can be applied at all level of any entrepreneurial skills development.	150(75%)	50(25%)
2	the level of the application of mathematics knowledge	150(75%)	50(25%)

	influences entrepreneurial skill acquisition		
3	Teaching of entrepreneurial skills need adequate basic knowledge of mathematics	150(75%)	50 (25%)
4	Knowledge of Mathematics helps entrepreneur, towards increasing their daily income.	60(30%)	140(70%)
5	The knowledge of Mathematics iimproves the managerial skills of the entrepreneur in their everyday life.	25(12.5%)	175(87.5%)

Table 3 shows that 75%of female respondents agreed that Mathematics can be applied at all level of any entrepreneurial skills development.75% of female respondent agreed that the level of the application of mathematics knowledge influences entrepreneurial skill acquisition. 75% of the female entrepreneurial skill instructors agreed that teaching of entrepreneurial skills need adequate basic knowledge of mathematics. 70% of female respondent disagreed that the Knowledge of Mathematics helps entrepreneur, towards increasing their daily income.87.5% of female respondent disagreed that the knowledge of Mathematics improves the managerial skills of the entrepreneur in their everyday life.

Research Hypotheses

Table 4

Ho: There is no significant difference between the influence of the level of mathematics knowledge acquired by male on their success in entrepreneurial skills development and the influence of the level of mathematics knowledge acquired by female on their success in entrepreneurial skills development

Ratings / Respondents	Agree			Disagree			
	O	E	$\frac{O-E/^2}{E}$	O	E	$\frac{O-E/}{E}$	Total
Male	50	52	0.077	51	49.5	0.045	101
Female	52	50.5	0.045	47	48.5	0.046	99
Total	102			98			200

Computation of X^2

$$X^2 = \sum \frac{O-E/^2}{E} = 0.0770.045 + 0.045 + 0.046 = 0.213$$

$$\therefore C = \sqrt{\frac{X^2}{N + X^2}} = \frac{0.213}{200 + 0.213}$$

$$= \sqrt{\frac{0.213}{200.213}} = \sqrt{0.0011} = 0.033$$

Degree of freedom = d.f = 1 at Significant level = 0.05

X^2table(1,0.05)=3.841X^2 calculated = 0.213

Decision : Since the X^2 calculated = 0.213 is less than X^2table(1,0.05)=3.841we accept H_O: There is no significant differences between the influence of the level of mathematics knowledge acquired by male on their success in entrepreneurial skills development and the influence of the level of mathematics knowledge acquired by female on their success in entrepreneurial skills development

Discussions:

The result as shown in table 1 indicates that the application of mathematics contributes to the development of an entrepreneurial skill. This implies that basic knowledge of mathematics is a pre=requisite for entrepreneurial skill development.

The result as shown in table 2 and 3indicates that there is gender effect on the level of acquisition of mathematics knowledge influence on success in entrepreneurial skill development.

The result as shown in table 4 reveals that the X^2 calculated = 0.213 is less than X^2table (1, 0.05)=3.841,hence H_O is accepted that there is no significant differences between the influence of the level of mathematics knowledge acquired by male on their success in entrepreneurial skills development and the influence of the level of mathematics knowledge acquired by female on their success in entrepreneurial skills development. This implies that gender do not have effect on the influence of the level of mathematics knowledge acquired and the success achieved in entrepreneurial skills .The contingency coefficient C computed to text the extent of the relationship give 0.033 which indicates low relationship between male and female respondent.

Conclusion

In the views of Odumosu &Olusesan,2016, "All these which can build an entrepreneurship activities successful can be provided through the knowledge of Mathematics", the study revealed that application of mathematics in entrepreneurial skill development is essential for rapid and sustainable economic growth and development; reduction in unemployment and poverty. It also reveals the concepts of Mathematics that is applied during the development of entrepreneurial skills .The level of basic mathematics knowledge acquired by an entrepreneur determines his /her incomes and earnings or the profit maximization function

Recommendations

- Government should make sure that every citizen attains basic education which will give them access to basic Mathematics knowledge.
- Government agencies at the state and local government levels should locate special basic schools at strategic places in the communities for those adults who are disadvantaged from attending the formal school in time and space.
- Government should make available standard curriculum for entrepreneurial skill development. This should have basic Mathematics as a major course.

References

Aboit, Lewis Fredrick, (2003). Industry and Enterprise. An International Survey of Modernization and Development.

Abott Lewis F. (2003): Concept of Development. Operational Needs Assessment Concept of Operation, Operational requirements and High – Level Conceptual Definition Importance of Development.

.

Igbongidi (2010): Meaning of Entrepreneur, Enjoy Business Challenges and sees these Challenges as

Stepping Stories Towards Success.

Igbongidi, B.P (2010). Entrepreneurship: A Strategic Tool for Sustainable Development. A Paper Presented at the 22nd ABEN National Conference at Federal College of Education, Abeokuta.

Nworgu, B,G (2006): Educational Research Issue and Methodology Ibadan Oluseji Press.

Odumosu M.O and Olusesan E.G(2016) Relevance Of Mathematics Education To

Entrepreneurship Skills Acquisition Towards The Realization of Vision 20:2020.*International Journal For Cross – Disciplinary Subjects In Education .7(2).2768*-2773

.

Shelby L. B (1939 – 2001) Math Skills and Entrepreneurial Success Theories of the Application of Mathematics in Entrepreneurial Development Student.

Sonoike O. (2006). Concept of Entrepreneur. Youth should be Creating Innovative, Self Reliant and be Prepared.

Stem Education: Implications for Society Transformation through Creativity in Biology Classroom Teaching in Senior Secondary Schools in Nigeria.

by

Okoye, Patience .O. And Onwuachu, Winifred .C.
Department of Biology, Nwafor Orizu College of Education
Nsugbe, Anambra State.

Abstract
This study focused on STEM Education: implications for society transformation through creativity in Biology classroom teaching in Senior Secondary Schools in Nigeria. A descriptive survey design was employed. The study was carried out in forty-two (42) Public Secondary Schools in Nnewi Education Zone of Anambra State. Three research questions and a null hypothesis guided the study. The population comprised all the biology teachers numbering 68 (12 males and 56 females) in the existing public secondary schools. No sampling technique was applied since the whole biology teachers were used because there were few. Instrument for data collection was a structured questionnaire, developed by the researchers. Instrument was face validated by two science educators and two measurement and Evaluation lecturers in the faculty of Education in Anambra State University, Uli. Reliability of the instrument was established using Pearson Product Moment Correlation Coefficient, which gave a reliability coefficient index of 0.85. Data was analyzed using mean for research questions and t-test for null hypothesis at 0.05 level of significance. The results revealed among others; that male and female biology teachers used only two creativity teaching methods such as discussion and direct instruction while many other methods like: brainstorming, problem solving were not used. Some constraints such as: insufficient instructional equipment, poor motivation were revealed as hindrances to the use of creativity teaching methods; while retraining, in-service training of teachers through workshops, conferences and seminars are strategies for enhancing creativity teaching methods; there is no gender bias on the use of creativity enhancing teaching methods in biology

classroom instructions. Recommendations and conclusion were highlighted.

Key Word: STM Education, Society, Creativity, Biology.

Introduction

Science, Technology Engineering and Mathematics (STEM) education, remains an indispensable tools for society transformation. If STEM education is properly planned and executed, the society can experience breakthrough in every facet of her life. Thus, any nation, that neglects the teaching and learning of STEM education in her schools does so at the risk of remaining undeveloped, (Igboegwu, 2016). The level of scientific and technological development of any society depends on a qualitative and functional STEM education (Aibongbe, 2010). It is through qualitative and functional STEM education that appropriate scientific, technological and technical skills are transmitted to be students, (Chinwoke, 2009). Technology is better developed than transferred (Ocho, 2005). It is through creativity in biology classroom teaching that our local or indigenous expertise can be developed for the solution of our peculiar problems, which will help in society transformation, (Aibongbe, 2010). Okoye, (2016), started that most African countries including Nigeria have remained undeveloped largely because of the unsatisfactory state of teaching STEM education. For any nation to succeed in developing the talents through which her dreams of technological growth and society transformation can be realized, the necessary foundation must be laid from secondary schools through creativity in STEM education teaching, (Ocho, 2005). Nwagbo, (2008), opined that an effective delivery of biology through creative teaching is expected to expose the students to scientific knowledge and skills necessary for society transformation. When these scientific knowledge and skills are properly acquired through creativity in biology classroom teaching; experiments, practical work in science laboratories and technological workshops respectively; the students can apply them in rendering useful services in transforming the society at large.

A society is a group of people that share similar values, laws, culture, norms and traditions; living in an organized communities for mutual benefits, (Jenkins, 2002). Abubaka (2010),

opined that active integration of the societal needs, culture, norms and aspiration with STEM education teaching would facilitate economic growth driven by society transformation. Abubaka (2010), further maintained that STEM collaboration would enhance scientific research that will adequately harness and utilize local resources for African technology development for self reliance and society transformation.

Transformation means a complete change. Longmans English dictionary defined transformation as means to improve a system, an organization, by making a lot of changes to it, so that it operates in a fairer or more effective way; plans to radically transform the system. Agummuo, (2013), viewed transformation as a tool intentionally used to bring into existence and practice something new, so as to enhance performance and growth of technology through improvement in efficiency and effectiveness.

Biology is one of the popular science subject offered by both arts and science based students in Senior Secondary Certificate Examination (SSCE) in Nigeria. Studies have shown that there is an increasing yearly enrolment in SSCE biology, but each year candidates achieve poorly in examination, (Nwagbo and Obiekwe, 2009). Biology is expected to help students to understand their environment and to maximize the management of their environment. Unfortunately, students perform poorly in biology examinations; this has led biology educators (Okoli, 2012; Okoye, 2011) to search for innovative methods and strategies to impart the knowledge of biology. Longshaw (2009) opined that many teachers are often reluctant to step outside the boundaries of the "safe and uninspiring" lessons into the more challenging, more effective and interesting creative lessons. According to Bolaji, (2007) STEM education in this 21st Century demands the cultivation and nurturing of creativity development in students, especially in the secondary school level, where career abilities are groomed and potentials and talents discovered are energized.

Creativity is defined as the ability to generate ideas or possibilities that may be useful in solving problems, communicating with others and entertaining oneself and others (Kaufmann & Sternberg, 2010). Creativity may also mean turning new and imaginative ideas into reality. Njoku and Nwagbo (2014), opined that instilling creativity in biology classroom is a crucial factor in

developing learners' mind. The development of creativity in individuals is so crucial to the survival of both the individual and nation that the National Policy on Education, Federal Republic of Nigeria (2014) stresses the need for inculcating in the child the spirit of inquiry and creativity. Educators (Maduabum, 2010; & Eneasator, 1999), researched the nature of creativity and reached a consensus that although every individual possesses elements of creativity to a greater or lesser extent, it can be developed. Mkpa, (2009) stated that schools should address themselves to developing it. Even when creativity is largely inherited, it manifestation is facilitated by the presence of a harmonious nature-nurture interaction of conducive psychological and physical environmental learning condition. When teachers make their lessons creative, then students become more engaged, motivated and more likely to participate in any given task, (Bowkett, 2006). This implies that creativity enables students to be more innovative, sharpen students' imaginative thought, improve their thinking skills and reasoning abilities, (Okoli & Mbonu, 2004). There is therefore the need for training students in creativity through biology classroom teaching for skills acquisition which can be applied for self-reliant and society transformation in Nigeria. Thus, development of creativity is a vital outcome of learning which must be developed in students. It calls for the learner's ability to bring into existence ideas, that are novel or unique, which are highly needed for society transformation. According to Nwosu, (2004) some impediments to development of creativity among students include: non-rewarding of creative expressions, non-utilization of creative methods of teaching, teacher's classroom behaviours, lack of learning materials and enriched learning environment. These impediments hinders the development of technological skills.

Teaching for creativity or with creativity include: all characteristics of good teaching such as high motivation, high expectation, the ability to communicate and listen, the ability to interact, engage and inspire, (Igboegwu, 2016). Creative STEM educators need to use the techniques that stimulate curiosity, divergent thinking, self-esteem and confidence, (Kaufmann & Sternberg, 2010). Omorogbe & Ewasiha, (2013), were of the opinion that effective and quality STEM teaching lies with the teacher's capacity to transform written knowledge into forms that

are pedagogically powerful and adaptive to student's abilities and backgrounds. Creativity in biology classroom teaching implies activity and active participation of the learners. According to Best & Thomas (2007) teachers need to involve students more in their own learning, act as facilitators or guide the students to find solution to problems rather than direct instructions. It is through practice and activities that creativity develops. Thus, teaching that expose learners to challenging overt as well as intellectual exercises that are very effective in attaining the instructional objectives of creativity development, (Omiko, 2014). As a wheel rotates around the hub, the STEM education system rotates around the STEM teachers. In fact, no educational system can rise above the quality of its teachers, (FRN, 2014). The method of instruction employed by STEM teachers are crucial in determining the extent to which creativity can be developed in students, (Okoli, 2012).

STEM teachers should lay emphasis on learner-centred methods such as: project method or assignment, discussion (large and small group), brain-storming, discovery, fieldtrips and questioning, (Okoye, 2014). If these are properly planned and executed with the objective of "creativity development" in mind; will go a long way towards helping to cultivate the desired creativity. Some of the activities demands physical and mental effort on the part of the learners. The physical effort involves: hands-on-minds-on activity, exploration, manipulation, observation and recording of things observed, analysis of situation and events.

When students' potentials are well developed through creativity in biology classroom teaching, the society will be highly set for a rapid economic growth and society transformation. This implies that students can utilize the acquired skills and expertise to perform specialized task and this will help to increase work efficiency and productivity; human and physical resources will be better managed; more goods and services gainfully produced, thereby helping to bring about rapid economic growth and society transformation, (Ezeudu, 2008).

This study also examines the influence of gender on STEM teachers in efficacy of society transformation through creativity in biology classroom teaching. The poor state of STEM education teaching provided a case for investigation by looking at the relative effects of the male and female STEM teachers in society

transformation through creativity in Biology classroom teaching. Adegboye, (2012) suggested that male STEM teachers are less anxiety during class-activity in creative biology classroom than female STEM teachers that show lower confidence during class exercise in creative biology classroom teaching.

The STEM educators especially, biology teachers should as a matter of urgency in this 21st Century make a paradigm shift from being an instructors, expositors, fact giver, and verifiers to facilitators, and stimulators, incorporating creativity activities into biology classroom teaching. This is imperative if students must acquire the relevant scientific knowledge, skills and competences needed for society transformation in this present scientific and technological age. This, therefore calls, for STEM education programmes that can improves the society and bring about the desired transformation through creativity in Biology classroom teaching in Senior Secondary Schools in Nigeria.

Research Questions

Three research questions guided the study:

1. What creativity enhancing teaching methods do male and female biology teachers use in biology classroom teaching?
2. What are the constraints militating against the use of creativity enhancing teaching methods in biology classroom teaching?
3. What are the strategies for enhancing creativity teaching methods in biology classroom teaching?

Hypothesis

The study was guided by one null hypothesis tested at 0.05 level of significance.

$H0_1$: There is no significant difference between the mean ratings of male and female biology teachers on the use of creativity enhancing teaching methods in biology classroom teaching.

Method:

A descriptive survey research design was used for the study. The study was carried out in the forty-two (42) public secondary schools in Nnewi Education Zone of Anambra State. The

populations comprised all the biology teachers numbering 68 (12 males and 56 females) in the existing public Secondary schools in Nnewi Education Zone of Anambra State, (Source: ANSPPSSC: 2017). The researchers did not involve any sampling technique since the number of biology teachers was not large. The instrument for collection was a structured questionnaire titled: "Creativity in Biology Classroom Teaching" (CBCT), developed by the researchers. The instrument "CBCT" consisted of two clusters, A and B. Cluster A sought information on Bio-data of the respondents, while Cluster B sought information on creativity enhancing teaching methods which male and female biology teachers used. This was structured on 3 point scale and weighted as follow: used = 3, not used = 1, while the constraints militating against the use of creativity teaching methods and the strategies for enhancing creativity teaching methods were constructed on 4 point likert scale and weighted as follow: Strongly Agree (SA) = 4, Agreed (A) = 3, Disagree (D) = 2, Strongly Disagree (SD) = 1. The instrument was face validated by three science educators and two Measurement and Evaluation Lecturers in the faculty of Education in Anambra State University, Uli. The instrument was modified using their suggestions to ensure face validity. "CBCT" was trial tested by administering the instrument on 20 biology teachers in an area not involved in the study. The data collected was used to compute the reliability using Pearson Product Moment Correlation Coefficient, which gave a reliability index of 0.85.

A face-to-face method of administration was used to ensure a hundred percent (100%) return of the questionnaire. Data collected were analyzed using mean and standard deviation for answering research questions and testing the null hypothesis with t-test at 0.05 level of significance.

A criterion of mean ratings of 2.50 and above were accepted and agreed while those below 2.50 were not accepted.

Results

The findings of the study were presented in tables sequentially, beginning with the research questions before the hypothesis.

Research Question 1:

What creativity enhancing teaching methods do male and female biology teachers use in biology classroom teaching?

SN	Questionnaire	Male	Respondents	Decision	Female	Respondents	Decision
		$\bar{X}$	SD		$\bar{X}$	SD	
1	Inquiry	2.22	0.72	Not used	2.24	0.42	Not used
2	Guided Discovery	2.44	0.62	Not used	2.26	0.62	Not used
3	Problem-Solving	2.32	0.58	Not used	2.32	0.35	Not used
4	Concept mapping	2.11	0.52	Not used	2.08	0.61	Not used
5	Questioning	2.31	0.52	Not used	2.42	0.51	Not used
6	Discussion	3.16	0.92	Used	2.68	0.52	Used
7	Peer-led team	2.18	0.75	Not used	2.45	0.72	Not used
8	Brain storming	2.26	0.48	Not used	2.44	0.72	Not used
9	Field trips/excursion	2.48	0.54	Not used	2.42	0.38	Not used
	Concept mapping	2.32	0.68	Not used	2.48	0.64	Not used
10	Project/Assignment	2.21	0.88	Not used	2.45	0.48	Not used

11	Co-operative learning	2.42	0.60	Not used	2.39	0.69	Not used
12	Experimentation	2.15	0.67	Not used	2.18	0.61	Not used
13	Drill and practice	2.24	0.60	Not used	2.44	0.60	Not used
14	Mental modeling	2.08	0.72	Not used	2.08	0.75	Not used
15	Direct Instruction	3.08	0.88	Used	3.15	0.88	Used
16	Inquiry	2.22	0.72	Not used	2.24	0.42	Not used

Table 1 shows that male and female biology teachers in this study used only two out of sixteen creativity enhancing teaching methods listed (item 6 and 16) with a mean of 3.16 (SD 0.92) and 3.08 (SD 0.88) for male biology teachers and 2.68 (SD 0.52) and 3.15 (SD 0.88) for female biology teachers. This indicates that both male and female biology teachers are not using creativity enhancing teaching methods in biology classrooms.

Research Question 2:

What are the constraints militating against the use of creativity enhancing teaching methods in biology classroom teaching?

Table 2: Mean ratings and Standard deviation of the Biology teachers on constraints militating against creativity enhancing teaching methods in Biology classroom teaching

S/N	**Questionnaire items**	$\bar{X}$	SD	Decision
1	Large class-size in biology classroom	2.56	0.51	Agree

2	Lack of creativity skills on biology teachers	2.62	0.66	Agree
3	Biology teachers classroom behaviours	2.66	0.82	Agree
4	Poor motivation of biology teachers	3.08	0.88	Agree
5	Overloaded content of biology curriculum	2.74	0.84	Agree
6	None provision of improvised materials	2.88	0.76	Agree
7	Lack of enriched learning environment	2.66	0.82	Agree
8	Students lack of interest in biology creativity exercises	2.67	0.64	Agree
9	Insufficient biology instructional materials/equipments	2.50	0.61	Agree
10	Lack of enriched learning environment	3.80	0.51	Agree
	The nature of classroom climate	2.60	0.61	Agree
11	None utilization of creativity teaching methods	2.56	0.55	Agree
12	Pressure for WASC Exams do not give room for creativity	3.00	0.95	Agree

13	No provision for creativity in biology curriculum	2.78	0.57	Agree
14	Large class-size in biology classroom	2.56	0.51	Agree

Table 2, shows that biology teachers agreed that all the listed items are constraints to the use of creativity enhancing teaching methods. This is because the mean scores of all the items were above 2.50 cut-off point.

Research Question 3:

What are the strategies for enhancing creativity teaching methods in biology classroom teaching?

Table 3: Mean ratings and standard deviation of biology teachers on strategies for enhancing creativity teaching methods in Biology classroom teaching.

S/N	**Questionaire items**	$\bar{X}$	**SD**	**Decision**
1	Ability to be creative	3.10	0.74	Agree
2	Ability to be innovative	2.57	0.50	Agree
3	Showing students that their ideas have values	2.52	0.56	Agree
4	Accepting unusual ideas, questions of students	2.84	0.62	Agree
5	Providing enriched physical learning equipment such as	2.59	0.60	Agree

	equipment, gadgets, apparatus etc			
6	Providing opportunities and materials for stimulating curiosity, imagination and creative work	2.81	0.64	Agree
7	Encouraging students exercises on hands-on-mind on activity in biology	2.64	0.74	Agree
8	Allowing students to decide on closure of an idea, experiment and assignment	2.52	0.56	Agree
9	Encouraging improvisation of materials	2.57	0.66	Agree
10	Integrating creativity through project/assignment	2.52	0.56	Agree
11	Retraining and in-service training of biology teachers through workshops, conference and seminars	2.84	0.62	Agree

Table 3, shows that biology teachers agreed that all the listed items are strategies for enhancing creativity teaching methods in biology classrooms. This is because the mean scores of all the items were above 2.50 cut-off point. This implies that some strategies for enhancing creativity teaching methods include: retraining and in-service training through workshop, conference, seminars, providing materials for stimulating curiosity, imagination and creative work.

Hypothesis

There is no significant difference between the mean ratings of male and female biology teachers on the use of creativity enhancing teaching methods in biology classroom teaching.

Table 4:

t-test statistics on mean ratings of male and female Biology teachers on the use of creativity enhancing teaching methods in Biology classroom teaching.

Questionaire item	No. of Biology Teachers	$\bar{X}$	SD	t-cal	t-critical
Male	12	1.30	0.70	0.063	1.96
Female	36	1.45	0.84		

Table 4, indicates that t-calculated is 0.063 and t-critical 1.96. since t-calculated is less than t-critical the null hypothesis is accepted. Therefore, there is no significant different between the mean ratings of the male and female biology teachers on the use of creativity enhancing teaching methods in biology, classroom teaching. This indicates that there is on gender bias on the use of creativity enhancing teaching methods in biology classrooms.

Discussion and implications of the findings

The findings of the study revealed that male and female biology teachers used only two creativity enhancing teaching methods such as: discussion and direct instruction while many other methods like: inquiry, problem-solving, concept-mapping, questioning and so on were not used. This implies that both male and female biology teachers do not make use of creativity enhancing teaching methods. This is in line with (Longshaw, 2009) who reported that many teachers are often reluctant to step outside the boundaries of the “safe and uninspiring” lessons into the more challenging, more effective and interesting creative lessons. The implication is that it will hinder students to acquire the scientific and

technological skills, which are the bedrock for society transformation.

The findings also revealed that there are some constraints such as: insufficient instructional/equipment, non-utilization of creativity teaching methods, poor motivation of biology teachers and so on that militates against the use of creativity teaching methods. This is in line with (Nwosu, 2004) who identified lack of teaching equipment and fund as factors militating against regular exhibition of some creativity enhancing behaviours in biology classroom. While Okoli & Mbonu, (2014) reported that materials resources for fostering creativity in biology students are grossly inadequate in many Nigerian Secondary School biology classrooms. The implication is that students will not be innovative or imaginative in their thinking skills and reasoning abilities. Thus, the appropriate scientific, technological and technical skills needed for society transformation may not be developed in students.

The finding also revealed that all the listed items are strategies for enhancing creativity teacher's methods. These include: retraining and in-service training of biology teachers through workshops, conferences and seminars. This is in line with Igboegwu (2016) who reported teaching for creativity includes: high motivation of teachers, high expectation, ability to interact, engage and inspire. Thus, the implication is that teachers teach the way there are trained, hence, no educational system can rise above the quality of its teachers.

The findings also indicated that there is no gender bias on the use of creativity enhancing teaching methods. This is implies that gender has no effect on biology teacher's level of application of creativity teaching methods in biology classroom instruction.

Conclusion

STEM education focuses on learning of scientific and technological skills for society transformation than of content; hence, there is a greater demand for creativity enhancing teaching methods like: inquiry, problem-solving, brain-storming, experimentation and so on, during biology instruction. This implies that biology educators have to make a change of mind-set and become truly creative and promote relevant scientific and technological skills needed for society transformation.

Recommendations

Based on the findings the researchers therefore recommend:

- That biology teacher need to be creative and should incorporate creativity activities into biology classroom instruction.
- Government should encourage and sponsor teachers to attend workshops and conferences.
- Science Teachers Association of Nigeria (STAN) should intensify their effort in capacity building and professional development of STEM teachers.

The Teaching and Learning of Systems of Linear Equation: A Realistic Mathematics Education (Rme) Approach

by

Menkiti Chika Cordelia
Department of Mathematics,
Nwafor Orizu College of Education Nsugbe
+2347039880920 fvaamd@gmail.com

and
Diala Paul Ikechukwu
Department of Mathematics Education
Imo State University ,Owerri Imo State
+2348134453365; dialapaul@yahoo.com

Abstract

Teaching systems of linear equations seems to have been a coaching problem since ancient times. Over the decades, the crude mechanistic approach has been adopted by teachers in the teaching and learning of systems of linear equation . In this approach, teachers take control over each activity while the students are passive learners. As an alternative to this traditional or mechanistic approach, there is need for an approach in which the students is actively involved in learning procedures step by step with the teacher demonstrating how to solve problems. This paper examines the teaching and learning of systems of linear equation: the Realistic Mathematics Education (RME) approach. This paper x-ray the meaning of RME and the core teaching principles of RME .The Realistic Mathematics Education approach shows how to formulate systems of linear equation from the construction of circuit board with its circuit diagram; resolving the resistors in each loops into a system of linear equation with current (I's) as the variable or unknown; the computation of the currents (I's) in each loop using inverse square matrix methods of solving systems of linear equation.

Keyword Mathematics, system of linear equation, realistic mathematics education approach

Introduction

Mathematics is the science that deals with the logic of shapes, quantity and arrangement. Mathematics is all around us ,in everything we do .It is the building block for everything in our daily lives ,including mobile devices, architecture(ancient and modern), art, money, engineering, and even sports.(Byline,2013) www.livescience.com what is Mathematics?

In reality, most Mathematics teachers are still teaching using the traditional or mechanistic approach which only engages the students with rote memorization and abstractness of concepts. These approach are contrary to cognitive development of students, because teachers do not provide sufficient time to actively involve the students in the learning process. Acccording to the developmental theory, knowledge cannot be transferred from a teacher to a student, but rather constructed by the students through active participation in the teaching and learning process.(Effandi and Muzakkir,2017) .To achieve high constructive ,creative and critical thinking skills and abilities in the students ,an approach to learning that is most appropriate is the realistic mathematics education approach to problem solving.

Realistic Mathematics Education (RME) approach is based on the idea of Freudenthal which says that mathematics is a human activity. Therefore, according to him ,mathematics should not be learned as a closed system but rather as an activity of mathematizing reality, which mean that students should not be confronted with ready-made mathematics as an “anti-didactic inversion” rather they are to be actively involved in the education process. RME was developed in the Netherlands with the characteristics that rich “realistic” situations are given a prominent position in the learning process. These situation which serve as a source for initiating the development of Mathematical concepts, tools, and procedures and as a context in which students can in a later stage apply their mathematical knowledge ,which then gradually has become more

formal and general and less context specific. RME involves six core principles for teaching mathematics which are inalienably connected to RME, they are

- The activity principle: here students are treated as active participants in the learning process
- The reality principle: here students are guided towards possessing the ability to apply mathematics in solving real -life problems
- The level principle: here students pass various levels of understanding: from informal context-related solutions, through creating various levels of shortcuts and schematizations, to acquiring insights into how concepts and strategies are related.
- The intertwinement principle: here students are offered rich problems in which they can use various mathematical tools and knowledge
- The interactivity principle: here students sees learning mathematics not only as an individual activity but as asocial activity which offers them the opportunity to share their strategies and inventions with others
- The guidance principle: here teachers have proactive role in students' learning by creating scenarios which have the potential to work as a lever to reach shifts in students' understanding.

In Mathematics, a system of linear equations (or linear system) is a concept under the branch of mathematics called Algebra. It is a collection of two or more linear equations involving the same set of variables or unknowns. For example, a general system of m linear equations with n unknowns can be written

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + \cdots + a_{1n}x_n = b_1$$
$$a_{21}x_1 + a_{22}x_2 + a_{13}x_3 + \cdots + a_{2n}x_n = b_2$$
$$\vdots$$
$$a_{m1}x_1 + a_{m2}x_2 + a_{m3}x_3 + \cdots + a_{mn}x_n = b_m,$$

where $x_1, x_2, x_3, \ldots, x_n$ *are variables or unknowns,*

$a_{11}, a_{12}, a_{13}, \ldots, a_{mn}x_n$

are the coefficients of the system linear equations and

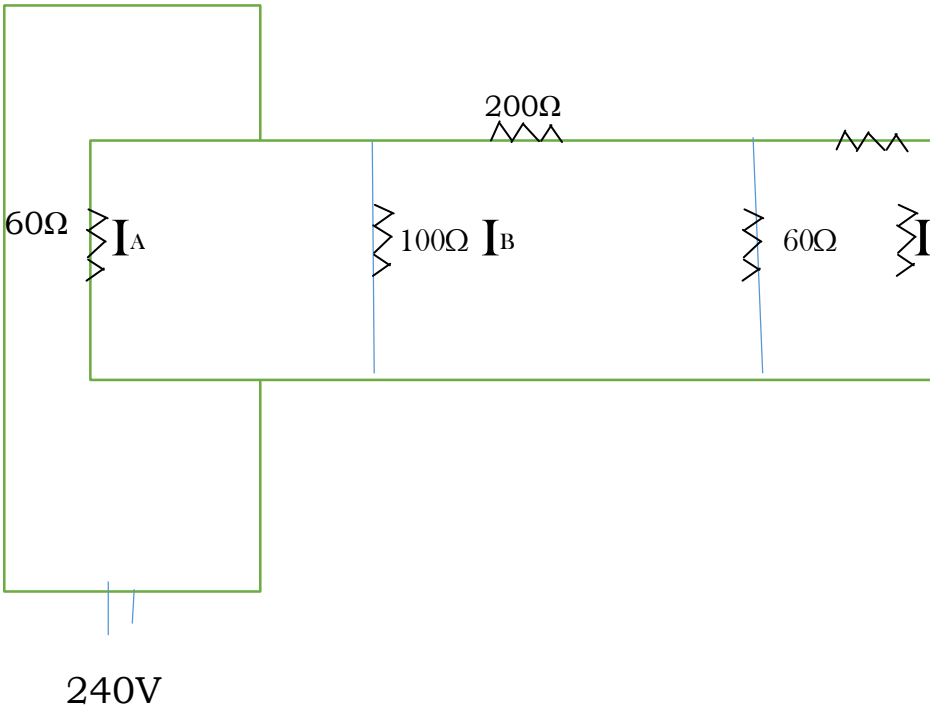
$b_1, b_2, \ldots, b_m$ *are the constant terms*

The above system of linear equation can be written or transformed into matrix form as

$$A = \begin{vmatrix} a_{11} & a_{12} & \ldots a_{1n} \\ a_{21} & a_{22} & \ldots a_{2n} \\ \vdots & \vdots & \ddots \vdots \\ a_{m1} & a_{m2} & \ldots a_{mn}x_n b_n \end{vmatrix}, \quad X = \begin{vmatrix} x_1 \\ x_2 \end{vmatrix}, \quad b = \begin{vmatrix} b_1 \\ b_2 \end{vmatrix}$$

The teacher guides the students in the construction of circuit board given a circuit diagram as shown below

Circuit Diagram



Materials required

1. Six lamp holders
2. One control switch
3. One wall socket
4. Two 200watts bulbs
5. Two 100watts bulbs
6. Two 60watts bulbs
7. One junction box
8. Insulated copper wire
9. Small switch (electric switch)
10. Wooden board

PROCEDURES

STEP 1: Get all the necessary materials ready for the work.

STEP 2: Cut the wire (length 25cm) with a cutter and connect it to one terminal of the lamp holder labeled (H) which is the life terminal and connect wire (black) to the other terminal labeled (N) neutral.

Repeat the above step (2) for the remaining five (5) lamp holders. After the connections, mount the lamp holders on the wooden board as shown in the circuit diagram.

STEP 3: Mount the control switch on the wooden board and connect the wires to the terminal of the control switch. From the control switch, connect a switch which controls the flow of current in the circuit. After the connection, link the wires to a junction box.

From loop (L), connect the first and the second lamp holder in parallel.

At the second loop, connect another lamp holder in series to the second lamp holder.

The connection is of three loops LA, LB, and LC in the

loop A (LA),: connect 60ohms resistor and 100ohms resistor in parallel;

loop B (LB),, connect another 100ohms resistor and 60ohms resistor in parallel with 200ohms resistor in series and

loop C (LC),, connect again another 60ohms and 100ohms resistor in parallel with 200ohms resistor in series.

ACTIVITY TWO

The teacher guides the students in resolving the resistors in each loops into a system of linear equation as

LA: $100I_1 + 60I_1 - 100I_2 + 0I_3 = 240$ ....Equation 1

LB:$-100I_1 + 100I_2 + 200I_2 + 60I_2 - 60I_3 = 0$

…… Equation 2

LC:$0I_1 - 60I_2 + 60I_3 + 200I_3 + 100I_3 = 0$

…… Equation 3

ACTIVITY THREE

The teacher guides the students to rearrange the systems of linear equation into matrix form thus:

$160I_1 - 100I_2 + 0I_3 = 240$

$-100I_1 + 360I_2 - 60I_3 = 0$

$0I_1 - 60I_2 + 360I_3 = 0$

$$A= \begin{bmatrix} 160 & -100 & 0 \\ -100 & 360 & -60 \\ 0 & -60 & 360 \end{bmatrix} = \begin{matrix} 240 \\ 0 \\ 0 \end{matrix}$$

ACTIVITY FOUR

The teacher guides the students in solving the above equations 1 ,2 and 3 using inverse square matrix method

$$A= \begin{bmatrix} 160 & -100 & 0 \\ -100 & 360 & -60 \\ 0 & -60 & 360 \end{bmatrix} = \begin{matrix} 240 \\ 0 \\ 0 \end{matrix}$$

Step 1: Find The Determinants; FIRST GET THE MINORS:

$$160\begin{bmatrix}360 & -60\\ -60 & 360\end{bmatrix}+100\begin{bmatrix}-100 & -60\\ 0 & 360\end{bmatrix}+0$$

DET A = 160 (129600- 3600) + 100((-100×360)–(-60×0)) + 0

= 160(126000) + 100(-36000-0)

DET A = 16560000

Step4 :SOLVING THE DETERMINANT OF THE MINORS OF EACH CELL THUS:

NOTE: 1,1 IS READ AS CELL OF ROW ONE ,COLUMN ONE AND SO ON

$$1,1=\begin{bmatrix}360 & -60\\ -60 & 360\end{bmatrix}=126000$$

$$1,2=\begin{bmatrix}-100 & -60\\ -60 & 360\end{bmatrix}=-36000$$

$$1,3=\begin{bmatrix}-100 & 360\\ 0 & -60\end{bmatrix}=6000$$

$$2,1=\begin{bmatrix}-100 & 0\\ -60 & 360\end{bmatrix}=-36000$$

$$2,2=\begin{bmatrix}160 & 0\\ 0 & 360\end{bmatrix}=57600$$

$$2,3=\begin{bmatrix}160 & -100\\ 0 & -60\end{bmatrix}=-9600$$

$$_{3,1} = \begin{bmatrix} -100 & 0 \\ 360 & -60 \end{bmatrix} = 6000$$

$$_{3,2} = \begin{bmatrix} 160 & 0 \\ -100 & -60 \end{bmatrix} = -9600$$

$$_{3,3} = \begin{bmatrix} 160 & -100 \\ -100 & 360 \end{bmatrix} = 47600$$

Step5: Forming a new matrix **B** using the determinant value of each cell thus:

B
=

$$\begin{bmatrix} 126000 & -36000 & 6000 \\ -36000 & 57600 & -9600 \\ 6000 & -9600 & 47600 \end{bmatrix}$$

Step 6: Transpose **B** and get the Adjoints (**Adj.B**)

$$\mathbf{Adj.B} = \begin{bmatrix} 126000 & -36000 & 6000 \\ -36000 & 57600 & -9600 \\ 6000 & -9600 & 47600 \end{bmatrix} \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$\mathbf{Adj.B} = \begin{bmatrix} 126000 & 36000 & 6000 \\ 36000 & 57600 & 9600 \\ 6000 & 9600 & 47600 \end{bmatrix}$$

Step7: Compute the currents (I_1, I2 and I_3) thus:

$$I_1 = \frac{126000 \times 240}{16560000} + \frac{36000 \times 0}{16560000} + \frac{6000 \times 0}{16560000} = 1.8261A$$

$$I_2=\frac{36000\times240}{16560000}+\frac{576000\times0}{16560000}+\frac{9600\times0}{16560000}=0.5217A$$

$$I_3=\frac{6000\times240}{16560000}+\frac{9600\times0}{16560000}+\frac{47600\times0}{16560000}=0.0870A$$

The individual values for each I, is the current flowing in each loop

Conclusions

The RME approach in the teaching of system of linear equation makes teaching and learning interesting and free from abstractions. It exposes the students to the interrelationship between mathematics concepts and physics concepts.

This study will equip the mathematics teachers with decisive impulse to reform the prevailing approach in mathematics education, by teaching mathematics that is relevant for students and carrying out thought experiments to investigate how students can be offered opportunities for guided inventions of mathematics.

Recommendations

1. We recommend that mathematics curriculum be developed to encourage the students to inculcate research oriented abilities which will lead to inventions in mathematics.

2. Teachers should adopt RME approach in the teaching of system of linear equations to promote adequate understanding and motivation to learn mathematics and apply it in real life situations.

3. Mathematics teachers especially in the tertiary institutions should be trained in the use of RME approach since the new curriculum emphasized on activity centered and student or learner centered for effective teaching of mathematics.

References

Byline. (2013) what is Mathematics? Available online at*www. livescience. com*and retrieved on 10th October 2018

Effandi ,Z. & Muzakkir, S. (2017)Effect of Realistic Mathematics Education Approach on Students' Achievement and Attitudes Towards Mathematics in International Scientific Publication and Consulting Services1.32-40 .Available online at *www.ispacs.com* and retrieved on 20th June 2018

Lerman S.(2014)(ed)Encyclopedia of Mathematics Education, DOI ,p522 Available at *www.rme ency...thed.pdf and* retrieved from 7th July 2018

Wood as Life Force: Igbo Ikenga Sculpture

Cosmas Onyenweuwa Mbawuike
Fine and Applied Arts Department
Federal University Ndufu-Alike
Ikwo Ebonyi.
Phone: 08036134837
Email: mbawuikecos@gmail.com

Abstract
Wood has remained one of man's basic construction materials from man's earliest times. It has been used for spirituality in terms of carvings and live totems. Note worthy is that indigenous architecture and art draw its material from available resources in the artist's locality. Igbo carvers in the classical era used wood for most of the sculptures that were produced for the society which were derived from the thick forest vegetation where the Igbo are geographically posited. Among these products were the Ikenga sculptures. The Ikenga sculpture in the Igbo mythology was a life force of a guardian spirit that protected a man and his family. This paper introduces wood as a medium for the Igbo-expression of her spirituality. The paper then assesses the physical and spiritual strength of wood as a medium among the Igbo and its choice for the production of the Ikenga as a spiritual force. The paper also concludes by elucidating this amalgam of wood and spirituality.

Introduction

The Igbo live in the area that is today geographically called South-Eastern region of Nigeria. They also spill into some parts of South-South region area of the country though in lesser population. They had lived for centuries in this part of the world before the British intrusion and subsequent colonization in the twentieth century. The Igbo cultural, religion and cosmology spin around an ordered existence involving spiritual forces and deities that have come to represent the Igbo way of life. One of such spiritual forces is Igbo Ikenga wood sculpture known as the cult of the right hand of a man. The Igbo Ikenga sculptural pieces were not made as representation of the forces in order to interest or please human

audience but as object within which the spirit may dwell. Nature in the Igbo cosmology in its broadest sense is not an empty impersonal object or phenomenon, it is filled with religious significance. Man gives spiritual life to natural objects even when the natural objects or phenomenon have no biological life. These objects are God's creation, they manifest him and they symbolize his being and presence. The Igbo strongly believe that it was these Ikenga sculpture and other spirit forces that influences and determine their social and spiritual wellbeing, political and economic stability, success and failure in life.

The Igbo Ikenga is unlike the type of Ikenga found in Igala land in present day Kogi State, they call theirs Okega, and the Benin and Delta groups, bordering Western Niger Igbo groups, who call theirs Ikengobo.

Concept of Igbo Sculpture: Wood As Life Force

Igbo sculpture should be viewed as born out of the people's traditional religious concepts and needs, its origin can never therefore be separated from the origin of their traditional religion. Obiora in Echeruo and Obiechina (1971) says "God created the visible universe (Uwa). Many aspects of the universe exist in two levels the nature level, and the spiritual forces level, Alusi". Furthermore, in his own view, Arinze (1970), described these spirits which God created as his assistants, "Spirits are subordinates to Chukwu (God). They are God's agents. His messengers, and it is they who more or less run the world. No 'Alusi' (spirit), no matter how strong can affect anything without Chukwu".

The concept of traditional Igbo sculpture as held by Obiora in Echeruo and Obiechina (1971) again said:

> Traditional Igbo art (sculpture) is an Art of Belief. He further describe that once a statuette was carved and consecrated, which involved all sorts of rituals, it was believed that the spirit or God portrayed informed it. It was no longer a piece of wood but the spirit itself. Thus carving

was essentially a sacred activity. It was often carried on away from public gaze.

In the traditional Igbo society, carving is a sacred profession. This is why traditional carvers (sculptors) are not regarded as ordinary citizens. Anyanwu (2016) affirms, that, "…they share equal social and religious status with chief priests and diviners. They are regarded as people who can see beyond the physical world, as people who invoke or by incantations can invite spirits to inhabit their works". Because of their knowledge of the animistic powers of the trees, they know what necessary rituals and scarifies to perform so that the piece of carving may be acceptable to the spirit force.

These sculptural pieces were not made as representation of the spirit forces in order to interest or please human audience but as objects within which the spirits may dwell. They do not give them that beautiful image of man because they believe that man as a being is not perfect. So, because of this belief, they sought to represent the gods or spirit with a different structure to add force and power to the work. Ola Oloidi (1997:20) asserted,

> The African traditional abstraction is not the outburst of an uninformed imagination, but the concept of a mind in command of its culture. The abstract images of African art are not disorganized reality but reorganized reality; they are interpretations, not empty representations. The physical component of the image counts for little, while the spiritual component means nearly everything. Naturalism in art may deceive, spiritualism does not. This group believes real beauty is to be found only in the mind or character, not in the body. Physical beauty without morality is not beauty but vanity this is why traditional art is a moral instrument, an art for life.

The Igbo believe that not just any type of wood that can be used for these wood sculptures. Different types of wood have their individual spiritual significance and potency. Woods such as *Ogirisi Orji, Anunuebe, Ngwu* are preferred. This gives rise to the sayings,

"Ngwu bu Arusi", which means that "Ngwu is a deity". The tree *Ngwu* is relatively scarce, which give it the air of importance that it enjoys. The Igbo accords a lot of respect to any farm, land or ground where *Ngwu* is seen or grown. Egbo (2016) avers that "no part or branch of *Ngwu* wood is used for fire wood". Consequently, some well known men in the society do borrow a title name from the belief for their titles, such as "Ani na efu Ngwu" which means the "land/ground that can produce *Ngwu*". James (1980) says "Igbo gave identity and personality to the unknown spirit forces. Spirit was 'personalization' of forces which everyone feared and could not cope with on other levels. And once enrolled with on identity, a spirit became human beings".

Visual representations of these unknown forces were therefore made to form the basis of contact and communication with them. This was how carved images and shrines came into being. Establishing harmony and good relationship with these Igbo sculptures does not in any way deprive the people their own respect from the spirit force. This is what informed the saying that, "Arusi wakaria anya, agwa ya osisi ejiri pia ya". Which means when a deity over stretches its boundary, the wood which it was been produced or made of will be revealed to it".

The Concept of Ikenga

Religion and art have always been together, and every religion has used it at one point or the other to express its beliefs. Religion has used art decoration, for instructing the faithful, and for commemoration. Nwoga (1979), says "We the Igbo do not know what the supreme God is all about, but we believed in something that is higher than human being. We deal directly with the representations of God which we know". In the traditional societies, artists used their creativity and ability to produce objects that used as links to their creator or god's representatives.

The supreme God, according to an Igbo mythology, after creating the world saw the necessity for deputies or assistants,

otherwise it would be too burdensome for him alone to control the entire world. He then created the lesser spirits also known as gods or deities and assigned to each one specific powers and functions". These gods include *Amadioha* or *Igwekala* (god of thunder), *Aja-Ala* or *Ala* (earth goddess), *Iyi mmiri* (god of water like *Nwangene* and *Idemili*), 'Ikenga' (cult of man's right arm), *Ekwo Omumu* (fertility goddess), and a host of other spirit force. These gods are responsible to supreme God who remains the overall authority of all things. It was a common belief therefore that those spirit forces influenced and determined the people's social well-being, political and economic stability, success and failures in life. All sorts of sickness and misfortunes are attributed to these unseen forces. Aniakor (1984), asserted that "Deities like to be remembered, thanked, honoured and feasted and in return are expected to provide protection, fertility, high crop yields and general well-being for human custodians". The Igbo Ikenga sculpture, viewed as born out of the people traditional religions concepts and needs, its origin can never therefore be separated from the origin of their traditional religion.

Basden (1966) defines Ikenga as "exclusively a man's god", without the Ikenga, he said, "no householder would rest in peace, its absence would be considered fatal", while on the other hand, Chukwuezi (1985), view Ikenga as "the cult of the right hand which identifies with a man's diverse field of endeavour, provided his *Chi* (guarding spirit) agrees completely with his aspiration. It guarantees good fortune in farming, hunting, trading, war, creative arts, ritual and title taking events". Igbo Ikenga sculpture is in the image of a horned male figure made out of wood. The horn symbolizes the aggressive, assertive, and powerful nature of male being. Ram is an example of such male animal. This leads to the saying, *Ebule ji isi eje ogu* -the ram fights with its head".

Ikenga is known as one of the symbols of power and authority and it also serves as a link between the dead and the living – a cult of the right hand which is linked to ones *Chi*. It is a belief among the Igbo that there is no misfortune or success that can befall

a man without the knowledge of his *Chi*. For example, when one is successful or lucky, he will be told *Chi gi muanya* which means that "Your God is alive". *Chi onye na edu ya*: means "ones god leads him".

The Igbo Ikenga sculpted in wood, could be in abstract and highly stylized or less abstract and more humanistic. In a more elaborate form, Ikenga is given a head and it may also be given legs. John (1977) further explains that a typical Ikenga type is represented by seated male figure holding a matched in one hand (right) and a severed human head in the other and crowned with a pair of horns. Here, all the limbs are shown and given rounded less regular form, the proportions of the human figure are observed". Igbo Ikenga sculpture also depicts male genital, this makes reference to procreativity. It symbolizes procreation and fertility. Ikenga is maintained, kept or owned by men. Women do not own or commission Ikenga to be made for the. A woman is protected by her faterher's Ikenga and later by her husband's. The possession of Ikenga depicts high status, accomplishment, wealth and integrity in the society.

Conclusion

The Igbo wood sculptures are real to the people, and are believed to exist with definite functions. Generally, they stand as intermediaries between God and the people. Prayers and scarifies are made to God through them. The wood sculpture have been known for centuries to exist in various Igbo communities and other parts of Africa at large, and has roles to play in the upkeep and co-existence in such communities. It is also believed that the Igbo Ikenga influences the social order, condition and stabilization of human societies. Ikenga retains its prowess and powers over the living. This is as a result of the fact that man in his daily life is faced with the life of uncertainty, danger, scarcity of resources and powerlessness, which chase man around and make him to seek refuge in spirituality.

The Igbo are more religious than political and cultural. The Igbo deal directly with the pantheon of gods and deities like the

Ikenga and other spirit forces instead of relating with the supreme God through human intermediaries like the kings of Ife and Benin. Before the colonization and subsequent Christianization of Igbo land, the Igbo had a strong culture, tradition and a belief system. The Ikenga among other Igbo notable sculptures were regarded as fetish, primitive and idolatrous by the British colonialists and was also cast away because it did not look like those of the classical renaissance period. The sculptures were not naturalistic and do not go in accord with the intellectual norms of Western anatomy, perspective and proportion. Igbo Ikenga sculpture is an answer to satisfy the religious requirements of the traditional Igbo society, an art for life. Ikenga was not an empty representative or fetish it was the guardian spirit of it owner.

References

Arinze, F. A. in Boston, J. S. (ed) (1970), Sacrifice in Religion. Ibadan University press Ibadan.

Basdan, G. T. (1966), Among the Ibos of Nigeria, Ibadan: Ibadan University Press.

Chukwuezi, B. (1965), "Ikenga object among the Uzo-uwani Igbo and some manifestation of belief", in Ikoro, VoI, VI, No.2.

Cole, Herbert M. and Aniakor, C.C. (1984), Igbo Arts Community and COSMOS Regents of University of California.

James, E.O. (1980), Origin of sacrifice. Mac million Publishing co. New York.

John Boston (1977), Ikenga figures among the north-west Igbo and Igala, (Lagos: Federal Department of Antiquities, Nigeria), quoted in A.C. Afigbo, Ikenga: The state of our knowledge.

Nwoga, D. I. (1979).The supreme God as strange in Igbo Religious Though. Hawk Press Ahiazu Mbaise

Oloidi, Ola (1997), African contemporary art. B.A. lecture note.

Udechuwku, Obiora in Echeruo and Obiechina, E.N. (1971), Igbo traditional life, culture and literature. Cunch Vol.III.

Oral Interview

Anyanwu, E.I. (2016), A traditional Carver, in Mbaise, Imo State, Nigeria. Direct interview.

Egbo, P.O. 2016, traditional titled man, direct interview in Nsukka, Enugu State, Nigeria.

Photographic Ikenga image by Mbawuike Cosmas

A simple form Igbo Ikenga with Horns

The Ikenga figure, with a set of horns bears Matchet

on the right hand, and severed human head on the left. It depicts victory and represents a warrior's cult of the right hand in Igbo culture. It was gotten from Abo-Mbaise

Ikenga figure is Ram headed with a set of horns. It has a semi abstract face.