



## **EFFECTIVE USE OF TEACHING METHODOLOGIES IN SCIENCE, TECHNOLOGY AND MATHEMATICS (STM) CLASSROOMS IN NIGERIA: A PANACEA TO VISION 20:2020**

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### **ABSTRACT**

*This paper examines the possibility of Nigeria to be counted among the achievers of the World best 20 in knowledge based economy Vision 20:2020. Focusing on the attainment in Science, Technology and Mathematics education. The paper concerned specifically with the various teaching methodologies employed by teachers in Science, Technology and Mathematics (STM) classrooms that could be of significant impact on students' academic performance as a panacea to vision 20:2020. The paper recommends that Nigeria must design a plan that would sustain and protect the nation's educational reforms processes in STM. And donations received from international donors such as World Bank (WB), United Nation Educational Scientific, Cultural and Organization (UNESCO) and others should be judiciously utilized, valued and assessed regularly to see if target and goals are being achieved.*

**Keywords:** Effective, Selection, Teaching, Methodologies, Science, Technology, Mathematics, Achieving, Vision 20:2020.

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### **Contribution/ Originality**

This study contributes in the existing literature on how to improve classroom instructional delivery in Science, Technology and Mathematics (STM) subjects. It provides STM teachers with explicit explanations on teaching strategies and forum for selecting appropriate strategies that will match the learning style of their students.

## 1. INTRODUCTION

Nigeria has entered the league of achieving vision 20:2020. But the central question is that how realistic is Nigeria in achieving this noble objective of being among the world best 20 in knowledge-based economy, when majority of the population are not educated? That is why the Minister of State for Education, Wike (2011) declared that Nigerian's dream could only be attained if and only if its citizens are knowledgeable and well educated. Similarly the Academic Staff of the Universities (ASUU) in 2009 and 2011 demands among other funding of educational system to enable the country to produce world class graduates that can equally meet the current challenges in knowledge-based economy.

Discussing on the importance of Science Education and National Development Caillods et al (as cited in Earnest and Treagust (2002)), Citing explained that investing in Science education is a necessary condition for economic growth. While Salman (2005) Identified Mathematics as an indispensable tool for effective use of electronic resources. Evidences shown that nations that embrace Mathematics, Science and technology enjoy better standards of living and less development on others Nosa and Ohenhen (1998) 'As a developing nation, Nigeria needs more scientists and mathematicians to be able to position herself properly in the committee of nations and perhaps consistently address issues regarding development and its sustainability (Aguele et al., 2008). It is against this background this paper seeks to look at the educational attainment in science and mathematics (STM) in Nigeria as well as strategies and policies for sustaining (STM) education. The paper offered recommendations on the way forward on why Nigeria as a nation should improve the teaching of Science, Technology and Mathematics (STM) Education through effective use of teaching methodology due to their significance and importance in achieving vision 202020 to dispute the report of Vanguard of May 16, 2013 that Vision 202020 died with Yar'Adua, worse still, nothing replaced it. - See more at: (<http://www.vanguardngr.com/2013/05/202020-worse-than-blur-vision/#sthash.AQqZC6dz.dpuf>)

## 2. SIGNIFICANCE OF SCIENCE, TECHNOLOGY AND MATHEMATICS

In the recent past emphasis in Nigeria education has shifted to educating its citizens in science, technology and mathematics (STM). This mode was reflected in the National Policy of Education when it directed and recommends the Nigerian Universities to observe an enrolment ratio of 60:40 in favour of STM and related courses. This particular action confirmed the call made during the World Conference on Science in Budapest in Hungary in July 1999 aimed at promoting the professional development of teachers and educators and to develop new curricula, teaching methodologies and resources in response to the changing educational needs of societies (Earnest and Treagust, 2002) Making their contribution on science, technology and mathematics (STM) Education in Nigeria, Ukeje, (as cited in Aguele and Agwagah (2007)) observed that 'Without mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society'. This is a clear point that science,

technology and mathematics (STM) Education are the essential tools for every nation's development and they are equally essential tools for sustainability of every national development.

There has been rising global consciousness both at the grass roots and policy levels regarding the importance of STM Education, National development and how to sustain the development in which Nigeria is not left out. There is also the growing need to evaluate the Nigerian STM Education to see if the planned objectives have been achieved.

Ukeje (as cited in [Aguale and Agwagah \(2007\)](#)) asserted that the development of any nation is properly accessed by the level of Education of its citizens in STM. Now the central question is 'Do Nigerian citizens have the access to STM Education?' Giving the answer to the above question we believe there are distinctive opinions from individual. .... but responding, ([Wasagu, 2009](#)) opined that "in order to produce an open access to STM learning and encourage a broader spectrum of students to pursue studies in STM, we as teachers and lecturers must begin to rethink and address the diversity of learning styles among the students in our classroom".

With the few development reached in STM, there is a growing need for strategies and policies for sustainability and continuity. Strategies and policies for sustainable development is Science, Technology and Mathematics Education depend on adequate and continuous funding.

### 3. FUNDING STM EDUCATION

Education for sustainable development is according to [Ogunleye \(2007\)](#) the "catalytic process for social change that seeks to foster through education, training and public awareness – the values, behaviors and lifestyles required for a sustainable future"(p.37). It is about the learning needed to maintain and improve our quality of life and that of the generation to come and yet unborn. It is about equipping individuals, communities, groups, businesses and government to live as act sustainability; as well as giving them an understanding of the environmental, social and economic issues involved.

This is in line with [Okebukola \(2007\)](#) who identified four elements of sustainable development, these are, environmental sustainability, economic sustainability, social sustainability and political sustainability. These could only be achieved through strategizing and politicizing, the sustainable development in science, technology and mathematics education;

- i. To sustain STM ([Wasagu, 2009](#)) opines that Nigeria should invest heavily on STM similar to the Asian Tigers. According to him Japan rose to prominence as a result of vast investments she made after the world war. And Japan entry into the scientific and technological age was not an accident but as a result of a well planned implemented and sustained STM Education.
- ii. [Usman \(2004\)](#) challenges the federal government on the practicality and sustainability of funding the higher education and call for fundamental reforms strategically;
  - University autonomy;
  - Diversification of funding;

- Updating and restructuring the curricula to meet the demand in economy and ICT
- Develop innovative approaches to ensure continuity, re-tooling and capacity building of lecturers
- Promoting performance based reward system among tertiary institutions
- Mass mobilization and value re-orientation on students to emphasize hard work, discipline and selfless service

Aguele *et al.* (2008) Strategized development in terms of improvement in human being through the elimination of hunger, poverty, gainful and productive employment for all citizens that could lead to marginalization of STM Education and national development.

#### **4. THE STATE OF SCIENCE, TECHNOLOGY AND MATHEMATICS.**

According to Salman (2009) “the perennial low performance of Nigerian pupils in Mathematics has been attributed among other thing to inadequate knowledge of the subject matter content by teachers and poor instructional techniques”. Chainson *et al.* (2010) also wrote: Many students turn out to be miserable and in attentive in a Mathematics classroom, after being taught a topic and discover they could not memorize or recall such a concept with ease. The reason for this difficulty may vary but this could sometimes be related to the teaching method(s) being used to explain certain concepts.

#### **5. STEPS TO ATTAIN VISION 20:2020**

There are many steps to be followed and many roles to be played by teachers and lecturers if the country is to attain Vision 20:20 20. These include improving the teaching and learning of STM at all levels i.e. Primary, Secondary and Tertiary through effective use of Teachers’ content knowledge, instructional materials and methodologies of teaching. This paper is interested in discussing the various teaching methods employed by teachers in STM classrooms during instructional delivery.

##### **5.1. Selected Methods of Teaching Sciences, Technology and Mathematics**

One of the daunting challenges teachers of STM are facing today in their classroom is the accommodation of mixed ability (the gifted, the average and slow learners). This perhaps call for proper selection and effective use of appropriate teaching methodology that will match the learning style of each and every student. Teaching methodology plays a significant and fundamental role in students understanding, comprehension and retrieval.

Thought, there are many teaching methods, but not all of them are suitable in STM classrooms. Suffice here are condensation of some of the that could be useful in STM classrooms:

#### **5.1.1. Conventional Approach**

The graduate and systematic guiding through the hierarchy of scientific, technological and mathematical notions, ideas and techniques. This requires the instructor to be well informed about elementary science, technology and mathematics.

#### **5.1.2. Classroom Education Approach**

Advocated the teaching of Science, Technology and Mathematics through a paradigm of deductive reasoning.

#### **5.1.3. Rote Learning**

In teaching of Scientific, Technological and Mathematical results, definitions and concepts by repetition and memorization typically without meaning or supported by scientific, technological concept of education rote learning is used in teaching multiplication table, definitions, formulas etc.

#### **5.1.4. Exercises**

The reinforcement of Scientific, Technological and Mathematical skills by compiling large numbers of exercises of similar type of content taught.

#### **5.1.5. Problem Solving**

The cultivation of Scientific, Technological and Mathematical ingenuity creativity and heuristic thinking.

#### **5.1.6. Historical Method**

Teaching the development of Science, Technology and Mathematics within an historical, social and cultural context. This provides more human interest than the conventional approach.

#### **5.1.7. Standards-Based Science**

Technology and Mathematics: Focused on deepening students understanding of Scientific, Technological and Mathematical ideas and procedures.

#### **5.1.8. Rational Approach**

Uses class topics to solve everyday problems and relates the topic to current events or situations. This very approach focuses on the many uses of Science, Technology and Mathematics and help students the very reason why they need to have the knowledge as well as the applications of the acquired knowledge to real world situation outside the classrooms.

#### **5.1.9. Co-Operative Learning**

Is another approach that allows teachers to be organized in their classroom activities that translate into academic and social experience. Cooperative learning has been described as intellectually demanding, creative, open-ended and involve higher order thinking tasks. All these are the learning characteristics of science, Technology and Mathematics. ([http://en.wikipedia.org/cooperative learning](http://en.wikipedia.org/cooperative%20learning) 20 August, 2012 @ 19:36)

#### **5.1.10. Exposition Methods**

Involves a clear and proper sequenced explanation by the teachers of the ideas or concepts of Science, Technology and Mathematics.

#### **5.1.11. Games**

A procedures used predominantly to improve practice and basic skills that could be used effectively by teachers of (STM) to introduce new concepts and develop logical thinking in Science, Technology and Mathematics. Good Scientific, Technological and Mathematics attitudes are fostered through games.

#### **5.1.12. Guided Discovery**

Students are allowed to discover concept generalization in Science, Technology and Mathematics. Teachers are to give structural situations to serve as a guide.

#### **5.1.13. Investigative**

The idea of investigation to be used as a method is fundamental to Science, Technology and Mathematics. It leads to the understanding of the ways Science, Technology and Mathematics knowledge to be extended and solve problems within and outside the subject areas. It is a form of discovery.

#### **5.1.14. Laboratory Approach Method**

Is learning by doing where students are trained to manipulate concrete objects in structured situations.

#### **5.1.15. Simulations**

Is a recommendation of a situation or series of events, which may in any community. It requires students decisions based on previous knowledge, training or availability information.

### **6. CONCLUSION**

As a nation, Nigeria needs more scientists, technologies and mathematicians to meet the challenges posed by the changing world so as to fit in among committee of nations in the

attainment of vision 20:2020. This can only be achieved through effective use appropriate teaching strategies that could enhance instructional delivery in STM classrooms.

## 7. RECOMMENDATIONS

- i. Science Technology and Mathematics (STM) Education should be given proper attention if measuring full advertisement in national development can be attained (Aguele *et al.*, 2008).
- ii. The global changing in economics structure and employment pattern have been and is still affecting the Nigerian Societies. Unemployed of millions of graduates, especially long term is emerging as a major determinant of poverty leading to educational and security threats of the nation. For STM Education to be improved and sustained, the Government should have a plan for not only providing a sound and qualitative STM Education but also how to provide employment opportunities to its graduates.
- iii. The Government should provide a contextualized science, technology and mathematics curricula that will cover the Nigerian cultures and needs. This could only be achieved by improving the quality of education in science, technology and mathematics.
- iv. Nigeria as a matter of urgency must to design a plan that would sustain And protect the nation's Educational Reforms processes. The funding received from the World Bank (WB) United Nations Development Programme (UNDP), United Nation Educational Scientific, Culture and Organizational (UNESCO) and other donors should be judiciously utilized, valuated and assisted regularly to see if targets and goals are being achieved.
- v. Vision 20:2020 can be achieved through teachers' creativity, ingenuity, proper planning and perhaps effective use of the appropriate methodologies in instructional delivery.
- vi. Teachers should always keep abreast with the modern changes, in the instructional delivery.

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