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TOPIC/TITLE OF PAPER:
THE CHALLENGES OF TEACHING SCIENCE AND TECHNOLOGY IN INDIGENOUS AFRICAN LANGUAGES IN AN ERA OF GLOBALIZATION.

BY

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ABSTRACT:

Apart from the hieroglyphics of Egyptian antiquity, the African continent cannot boast of a time-tested written language or systemized code of graphic communication. Europeans had to undergo the onerous task of moulding linguistic building blocks, which enabled them to erect a super-structure or systematic code for writing indigenous African languages. Since colonial times, European languages have become the official medium of communication in African countries. The integrative and peace building nature of a lingua franca (L2) continued to de-emphasize indigenous African Languages (L1) in both pre and post colonial era. With the advent of colonial educational system, foreign languages inadvertently became the language of teaching in colonial schools. This was because no indigenous African Language had the wealth of vocabulary, elaborate syntactic structure, semantic generosity and philosophical background to effectively sustain the teaching of science in indigenous languages. In the Urhobo language of the Niger Delta for example, there is no clear demarcation between concepts like power and force; spirit and soul. It would be extremely cumbersome to impart or explain in Urhobo language that ‘tension’ in physics means force per unit length. Or what the coefficient of friction means. The discrete world of molecules, atoms, ions and cells is alien to African cultures, therefore these words/concepts are not part their vocabulary. The reality stands tall that African indigenous languages are deficient as the language of science and technology because of the crucial absence of vocabulary equivalents and an empirical philosophical base. These linguistic and philosophical short comings not only highlight the seeming impracticality of teaching science in mother tongues of Africans but embosses the position of English as the lingua franca of science and technology. Therefore this paper will focus on how to overcome these challenges, especially through the application of the tools of globalization – the Information and Communication Technologies (ICT) to enhance the suitability of African languages for teaching science. So that technology and language can be married to broker peace on the altar of globalization.

A SHORT BIO:

I am Dr. (Mrs.) Lizzy Orode, a Nigerian, and academician with over 20 years of experience in the lecturing field. I have conducted a number of scientific and field researches, singularly and in collaboration with others. I have participated in a number of workshops, attended several conferences and seminars. My Doctoral Thesis was on Science Education. I am a social worker with a commitment to African studies and an interest in the limitation of language to impartation of knowledge.
I would like to inform you that I am ready to attend and participate to your Fifth International Conference in November 6-8, 2008. The abstract of my paper is:

Swahili song as a unifying factor in East Africa

Swahili song is one of the most effective and flexible mediums, which reacts promptly with actual events. It is also considered as one of the quickest vehicles to transmit a message to the society, as it is one of the most favourable arts in the Swahili society with its various age-classes. The present paper highlights the sorts of Swahili song and elucidates how they have the potential to bring people of various ethnic groups in East Africa together.

I am Mohamed El-Mohammady Rizk. I was born in 1966 in Damietta (Egypt). I received my doctorate in 2004 at the University of Frankfurt am Main and I am presently a staff member of the Institute of African Research and Studies, Department of Languages, at Cairo University.

Publications in English:
THE CHALLENGES OF TEACHING SCIENCE AND TECHNOLOGY IN INDIGENOUS AFRICAN LANGUAGES IN AN ERA OF GLOBALIZATION

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ABSTRACT
Apart from the hieroglyphics of Egyptian antiquity, the African continent cannot boast of time-tested written languages or systemized codes of graphic communication. Europeans had to undergo the onerous task of molding linguistic building blocks, which enabled them to erect a super-structure or systematic code for writing indigenous African languages. Since colonial times, European languages have become the official medium of communication in African countries. The integrative and peace building nature of a lingua franca (L2) continued to de-emphasize indigenous African Languages (L1) in both pre- and post-colonial eras. With the advent of colonial educational system, foreign languages inadvertently became the language of teaching in colonial schools. This was because no indigenous African Language had the wealth of vocabulary, elaborate syntactic structure, semantic generosity and philosophical background to effectively sustain the teaching of science in indigenous languages. In the Urhobo languages of the Niger Delta for example, there is no clear demarcation between concepts like ‘power’ and ‘force’, ‘spirit’ and ‘soul’. It would be extremely cumbersome to impart or explain in Urhobo language that tension in physics means force per unit length. Or what the coefficient of friction means. The discrete world of molecules, atoms, ions and cells is alien to African cultures; therefore these words/concepts are not part of their vocabulary. The reality stands tall that African indigenous languages are deficient as the language of science and technology because of the crucial absence of vocabulary equivalents and an empirical philosophical base. These linguistic and philosophical shortcomings not only highlight the seeming impracticality of teaching science in mother tongues of Africans but also emboss the position of English as the lingua franca of science and technology. Therefore this paper will focus on how to overcome these challenges, especially through the application of the tools of globalization – the Information and Communication Technologies (ICT) to enhance the suitability of African languages for teaching science. So that technology and language can be married to broker peace on the altar of globalization.
Introduction
That English is the language of science and technology is a rather fallacious assertion. This position is informed by the empirical reality that the techno-political club of the G-8 Group of the world’s most industrialized nations is not constituted by only English – speaking nations. Britain, the United States of America and Canada are the only Anglophone countries in the G-8 cabal. In the other non-English speaking members namely: France, Russia, Germany, Italy and Japan, English is not used even as a lingua franca. Rather the mother tongues which are the respective national languages of these nations, are used officially and as the languages of instruction in schools. Therefore, going by the obvious reality that there are non-English speaking countries in the membership of the G-8, English is not the language of science and technology.

However, as a sub-theme, “English as the Language of Technology” is not without some merits. Prime among them is the fact that English Language is the world’s most permeating medium of communication, and the world’s most spoken language outside of its original shores, the British Isles. The British Commonwealth is the largest linguistic nation of the modern world, which pervasively covers India, Canada (British), Australia, the Caribbean, a large portion of Africa and many Islands and detached peoples. In these nations, English is the official language and the language of instruction, except in India where Hindi: is the official language. There, instruction at primary school level is done in Hindi, but at the University level, “the bulk of the Universities continue to have English as the medium of instruction with an option given to students to use own language also” (Krishnamurti, 2007). Krishnamurti (2007) pointed further in professional courses, English continues to be the medium of instruction and that on the whole, English is more popular in India and Hindi today than it was in 1947 when she had her independence.

Another merit is the fact that a sizeable number of English men and women contributed immensely to the development of science and technology with breakthroughs and inventions and have performed ingenious technological exploits throughout the windy history of human development: Isaac Newton, who discovered the laws of gravity, William F. Talbot who invented the camera (1935), Michael Faraday invented electricity (1813), Sir James Parson invented the steam turbine (1887), the weaving machine was invented in 1733 by John Kay, Jet
Engine was invented by Frank Whittle and over a thousand others. However, the scientific ingenuity of Marconi produced the wireless/radio transmission, he was Italian. Monsieur Dague invented photography; Galileo Gallilee invented the telescope in 1609. Two Chinese men, Yiying and Hiang Lingzam invented the clock and paper by a Chinese eunuch. The sewing machine was invented as early as 1830 by Thimonier, a French man, and Louis Pasteur who discovered bacteria was also French. Zacharias Gensen (a Dutchman) invented the compound microscope in 1596. Charles Babage, a German, invented the calculating machine. Power loom was a Swedish invention and tens of thousand of other inventions and scientific discoveries that were made by non-English speaking people.

Therefore, since Swiss, Swedish, Dutch, Russian, Italian, Chinese, Arabian, Indian, Greek and Egyptian scientists have all excelled in science and technology, it goes to confirm to all and sundry that English is not the language of technology, or reversibly, science with technology is not the prerogative of the English Language. As such, there is an ample opportunity, functional and creative space for indigenous African languages to be employed in the construction of scientific theories, principles, and ultimately in research and teaching, as the language of instruction. This paper will therefore x-ray the challenges of teaching science and technology in the mother tongues of Africans. It would go a step further to proffer effective solutions that would assuage the technical problems associated with the teaching of science in African indigenous languages and how to use the tools of globalization to advance this techno-linguistic objective.

**Language And Communication/Teaching**

The most important factor in communication is language. If there is no linguistic medium, thoughts no matter how ingenious, sublime or frivolous will for ever remain inert mental potential either as ideal or creative stream of mind stuff in the mind of the originator. So too, the most important thing about teaching is language. This is true because teaching is technically the communicative transmission of thoughts as ideals or concepts or informational piece to another, who is the learner. Without language teaching is not possible in the conventional world we live in, because language is a medium for conveying thought, ideas, concept, symbolical and technical information.
Even the greatest of all geniuses cannot impart knowledge to another without the agency of language. “Hence the human race evolved speech (language) as the main medium through which ideas are exchanged,” declares King (1961). Every body experiences the forces of gravity and friction everyday in life, but the knowledge of the laws of gravity especially its universality needed the mediumship of language to give it a discernable and appreciable form. Albert Einstein’s theory of relativity needed the language of science to translate it from the realm of thought to an understandable and conveyable form. Thus the theory graphically represented as $E = MC^2$ would have remained a mental abstraction in his brain if there were no language to transmit it to others. It is therefore clear that the most important factor in the teaching – learning process is language.

**Language And Culture**

No language, no matter how complete or how exalted its vocabulary, can exist in abstraction. Thus language exists within the precinct of and as the product of a culture. Language is the foundation of every culture. A people must first of all exist before they can evolve a form of verbal and graphic communication. A society is the largest form of human group. It consists of people who share a common heritage and culture, noted Shaefer and Lamm, (1997). Members of a human society develop their culture and transmit it to subsequent generations. And in this transmission and sustenance of culture (ideas and values), we find language as the most vital factor, and a pivot around which social interaction revolves in every human community. Language carries the main concepts and values of a culture (Frawley, 2007).

Language is a means of communication with others in different aspects of life. It is man’s greatest possession; one that distinguishes him from lower animals (Orode 2004). Language carves out a route, which people follow as a matter of habits and is thus a vehicle of communication. Hence we say that language is the channel through which we express such habits. Ase Khauno (2005) sees language as the hallmark of human communications and an abstract system of words, meaning and symbols for all aspects of culture. Language includes speech, written characters, numerals, symbols and gestures of non-verbal communication (Shaefer and Lamm, 1997). Therefore language is inextricably tied to culture. Understanding
the language of a people or an epoch is usually a rewarding attempt at understanding the culture in question and the ways of its people. Some times, culture goes beyond location; so does language. A linguistic society may transcend a unified or common geographical expression, as is the case of English and French as two dominant international languages. English is spoken throughout the English Commonwealth, while French is spoken in mainland France and several Francophone countries across the world.

Therefore, people make up society and consequently evolve culture. Culture is a way of life and refers to the norms and practices that include but transcend individual positions, writes Asraf and Sharma, (2007). According to the foremost New Delhi activist and linguist, G.N. Devy, there is a well-established view that culture has no other expression than language, and the two are one and the same. Devy (2006) maintains that cognition too would be impossible without language. He states further language has been used as a synonym for that which determines the outer boundaries of each transaction of human intelligence. However, how long language had been part of every world culture has been lost to antiquity. Devy (2006), in the same piece of writing titled “e Language and reality”, posits that language as a social institution, the nature of its exact origin, and the clear sequence in its formation are some of the mysteries in the epic text of human evolution.

The position of language in human intercourse and more importantly, in instruction is crucial to linguistic and social development in this era of globalization. Perceptions in general and outlook on life have been greatly influenced by language and its linguistic philosophical accessories. As Devy (2006) puts its succinctly, an individual’s ability to perceive the world is conditioned by verbal language. This led us to conclude that e language is a social institution. Thus it is by the agency of language that everything about the culture of the people is appreciated and preserved, (Tonukari, 2006).

**Language And Knowledge In Historical And Philosophical Perspectives**

As Tonukari (2006) puts it, the inevitable presence of a language and the growth of culture are complementary. There are major aspects of culture that facilitate the development of language. Prime amongst them are cultural universals and cultural diffusion. Universals, such as language, are general practices found in every culture, (Schaefer and Lamm, 2007), while cultural diffusion
refers to the process that spreads a cultural item from group to group or society-to-society, (Ibid). These two concepts naturally and inadvertently expand the vocabulary of the language of many human societies across various cultures. As the people of one culture try to learn about and acquire the wisdom and philosophies of other cultures, the vocabulary and the language structure of the recipient culture dilates and deepens in linguistic depth. This is a manifestation of horizontal transmission and diffusion of cultural features.

However, there had been that strong, intrinsic, self-motivated and environmentally inspired quest for knowledge by humanity over the millennia. This quest for knowledge and understanding about human situations, challenges and realities became formalized and systemized as philosophy. The Egyptians of old were the first people and culture to have a written language, the hieroglyphics and the first sets of written literature in human experience. Egyptian philosophies and their application predate anything in Europe or the Americas. One hundred and thirty – two thousand years ago, the Egyptian priests knew as much about the movement of the planets in this solar system as we know today (King, 1984:25). Thus, long before her decline set in, Egypt had laid the foundations of a culture on which that of the Western world was afterward built (Guest, 1977:14). Drawing strength, inspiration, practical knowledge and wisdom from the Egyptians, the Greek civilization flourished and consequently bequeathed the modern world with the philosophic thought of Greek’s antiquity. Ukagba (2005) points out Greek philosophy started when men were no longer satisfied with the mythological cum religious explanation of reality. Apart from Egypt, other cultures have added beauty to the world in philosophic wisdom and in the arts, which also predate the Greeks. But systemization of the quest and its outcomes make the Greek contribution to the pursuit of knowledge and human understanding unique. That explains why it serves as a formidable reference point. The first name in the history of philosophy is Thales of Miletus, celebrated among other things for his prediction of an eclipse in 585 B.C. Thales was a mathematician and, in an important sense, the founder of mathematics (Butler, 1972). The motivation for the pursuit of knowledge made the Greeks heroes of the world of learning and knowledge. Not that Thales was the first person to make mathematical calculations. The Egyptians, to speak of no other predecessors of the Greeks, had used ingenious mathematical rules in land measurement and in the planning of the pyramids, (Ibid). Butler (1972) has this to say: “But, so far as we can tell, the Egyptian interest in mathematics was
narrowly practical. If they discovered the proportion of the hypotenuse to the other two sides of a right-angled triangle, it was for practical, technical purposes, and when these purposes were satisfied their mathematical curiosity came to an end. They were like modern technocrats endowing research fellowships in hope that something of practical or financial advantage may accrue”. He extrapolated further saying: “What was special about Greek mathematics was that it was prompted not by a desire for material advantage, but by a desire to know, and that desire being insatiable, Greek mathematics continually progressed”(pg 91).

In the emerging project of reconstructing, adapting and systematizing African languages for instruction in science and technology, Africans must tow the line of the ancient Greeks, and be able to pursue knowledge for the sake of knowledge and be fired by a burning desire to know, rather than the current educational statuesque of advancing knowledge to eradicate poverty and meet the challenges of hunger and starvation. Butler (1972) reenacts that what is true of Greek mathematics is also true of Greek philosophy, at least in one of its most characteristic aspects: it is motivated by the desire to know. As the Greeks explored and exploited every available vista of knowledge, they recorded and systemized their findings, and thus created the first database or foundational pool of knowledge that the western educational system as we know it today had thrived on. As this was happening, their language continued to expand. For example, in the 4th century B.C. Aristotle and his pupil Theophrastus worked out the descriptions and principles of plant types and functions that remained the prototype for botanical observation for 1,000 years, Omoigui (2004, pg. 1).

Aristotle’s works covered all aspects of philosophy from poetics, through ethics to science. He was very much concerned with the subject of change, in an ever-changing world, and its implication to the study of physics. Change, which the Greek preferred to call ‘motion’, ran a long thread throughout the Greek philosophic tradition. The import of this philosophical development on the theme of this presentation, is that as the philosophers expanded and broke ground in their various endeavors, the language of the Greek people continued to evolve in vocabulary, as there arose the need to coin new words or create new derivatives of old worlds to give linguistic forms to these new concepts, ideals, nouns and processes.
Just as many as there were that philosophized about and on ‘motion’ or ‘change’, others looked inwards into the invisible world of infinitesimals. Around the 5th century B.C. Democritus expressed the belief that all matter is composed of very small indivisible particles, which he named ‘atomes’ meaning uncuttable or indivisible (Unuigbe, 2006). However, atomism, as propounded by Democritus became the subject of many scientific debates and experimentations, until the break through work of John Dalton, an English scientist and school teacher, who in 1808 theorized that all matter is composed of small particles as building blocks which he called atoms. From the philosophical works of Democritus came the word ‘atomes’ into the vocabulary of the Greek language; so too came the word ‘atom’ through the acceptance of Dalton’s atomic theory into the vocabulary of the English language and into the dictionary of science, as a material aspect of all scientifically endowed cultures. Thus, it is clear, how the quest for knowledge has expanded the scope of language, right from the Greek era, through the reign of the Roman empire, where Latin was the official language up to the modern world where English language seems to dominate other world languages especially in the western hemisphere.

Language and knowledge, as the two key concepts of the theme of this presentation have been put into historical and philosophical perspectives to highlight the how and why African indigenous languages came to lack the wealth of scientific culture and philosophical background to serve as veritable medium of instruction in science and technology. Culture and Language are said to be inextricable because the people’s cultural experiences and challenges create, influence and consequently expand the language that oils the social engine of the culture in question.

Therefore, the mere absence of a scientific and philosophic traditions in most African cultures or societies, make their mother tongues, as operational linguistic media of communication, to be highly deficient in scientific vocabulary units. And such a scientific culture is usually built on the dominant ideology of the people at a particular time. It is not surprising therefore, that the world ‘philosophy’ comes from a combination of two Greek words, “philos” loving and “Sophia” meaning wisdom. Etymologically, philosophy means the love of wisdom (Kessler, 1998:2). The dominant ideology of the Greeks at that time was pursuit of wisdom. The average ancient Greek then wished to be known as a sophist, wise one. That was the ideology that
sustained the Greek philosophic tradition and consequently fashioned the pattern which western education had followed.

The Functionality Of African Indigenous Languages In Teaching Science: The Missing Link

Evidences of an alphabet and a writing code were perceived in Ethiopia, and a few other anthropological traces of graphic communication in other parts of the African continent. Apart from these shadowy manifestations, it is only ancient Egypt that can boast of a writing code where they had the famous hieroglyphics, which its people have now lost to the Arabic writing code. Africa as a continent is peopled by discreet as well as fairly large linguistic groups. These peoples have a shallow historical foundation, all except the same Egypt, whose history dates backward beyond 100,000 years (King, 1977; Guest, 1986).

The history of African cultures and peoples is unfortunately and helplessly limited to the documentations of European Scholars. In all the historical accounts by the various European scholars on the reign of the Sudanese empires, there was none, in which the people’s educational system was highlighted, as they wrote generously about those folkways and the governments of Oyo, Benin, Ghana, Mali, Songhai, Kanuri and other sub-Saharan empires. In fact, apart from the fairly recent quranic studies, formal education, as we know it today was non-existent in indigenous Africa.

Therefore, formal education in mainland Africa was the direct fallout of imperialism. The core task of most colonial governments was to raise and educate a crop of Africans, who would be used to run the engine of colonial administration. The quest of the missionaries to preach the Christian gospel to the hinterlands and effectually evangelize the Africans also advanced the project of formal education, as missionaries owned most of the early schools. The Europeans had to bear the great burden of codifying the geography of their colonies by designing linguistic systems and building blocks, which enabled them to devise a writing format for African indigenous languages within the linguistic framework of the English alphabet, which is at par with the French Alphabet. This linguistic superstructure, having been erected on the foundation of the English alphabet and writing code, was functionally translated into a standardized writing
system of graphic communication in indigenous African languages. The Europeans left a rewarding legacy of linguistic mechanism for writing the mother tongues of Africa.

Languages and their writing codes evolve with the language. But it is a different thing to devise a writing code for a language you do not even understand. Thus, early Europeans were adepts and geniuses of linguistics, to be able to assign an ideogram for complex indigenous African words and their units. An ideogram according to a lexical definition is a symbol that is used to represent the idea of a thing rather than the sound of a word. The double consonants as in ‘vw’, ‘gb’, or the triple consonant combination as in ‘ghw’, are non-existent in English language, and would harass the English speaker from English background. But a literate Urhobo person knows that by the addition of different vowels to these consonants, various morphemes (i.e. the smallest unit of meaning that a word can be divided into) will be created. For example ‘awwerhe’ is the Urhobo word for sweet; the double consonant ‘vw’ in the middle can accept different words with any of the five major vowels. “Ughwu” means death. It makes a lot of linguistic sense to me as a first language speaker of Urhobo to see the rather weird combination of three consonants sandwiched between letter ‘u’ and vowel ‘u’, translating effectively into death in Urhobo as ‘Ughwu’. I really doff my hat for these European pioneers and linguistic explorers. Even their ability to diphthongize, which is the linguistic act of changing vowels into diphthong was nothing short of fantastic. (A diphthong, as the language people will tell you, is a combination of two vowel sounds or vowel letters). They were able to do this so effectively that every vowel sound and vocal inflection has been accounted for in linguistic expression by the linguistic ingenuity of early Europeans, such that the idiolect, as the way that a particular person uses language, had become a factor of linguistic identity and differentiation. This is because no two embodiments of a language have the same idiolect or the same idiolectic expression. Having erected the super-structure for writing and speaking most indigenous African languages, most Africans afterwards found it easy to graphically communicate in their mother tongue. Consequently, complex grammatical principles inadvertently began to apply, following the translation of the Bible in mother tongues of Africans. Morphosyntactic rule of adjective agreement is often broken when an English sentence is translated into an indigenous African language. Sometimes meaning is bastardized to an absurd degree. For example, ‘he is plucking leaves’ as an English phrase, would translate into Urhobo to mean, ‘he is mad’ or gone crazy.
Such absurd loss of meaning is not limited to only African indigenous languages. Labour, in the light of globalization appreciates in value and earns more income when it moves from a poor economy to a rich economy, so too words and concepts lose meaning when they are translated from a strong language to a weak one. The language in which the speaker is more proficient is the strong one and vice versa. Language, meaning and making sense as desired are crucial linguistic issues that have great bearing on the teaching-learning process. And when translating into local languages there are often no linguistic reference points, as such meaning and interpretation may have the divisive wall of misconception and mis-presentation. Therefore, it is necessary to find expressions and terms for concepts that translate into local languages in diverse cultural contexts. For example, a participant from Thailand shared at a regional consultation that when the Thai Ministry of Public Health sent a letter to health centres encouraging them to address gender issues in their work. The health personnel looked up the word in a dictionary and found that the term for ‘gender’ actually referred to ‘penis’ in Thai. Not surprisingly, great confusion ensued.

Therefore one of the missing links in the process of teaching science and technology in the mother tongues of Africans is the absence of an elaborate syntax structure.

**Lingua Franca, Language Transfer And Instruction In Mother Tongues: Linguistic Edge And Challenge**

Europeans on behalf of Africans had undertaken the first linguistic journey, the result of which enabled Africans to write their mother tongues on the graphic and linguistic foundations of European alphabets and writing code. It is now incumbent on Africans, nay imperative on Africans themselves to make the second journey to the promised land of scientific-socio-linguistics, so that the continent can be rewarded with the capacity and change in the linguistic status quo that will allow their mother tongues to become the language of instruction in science and technology. Towards meeting this continental challenge is the imperative to draw a line between the challenges of a lingua franca and those of teaching science and technology in mother tongues of Africa. Lingua franca as a linguistic term that describes a shared language of communication used between people whose main languages are different. It is usually referred to as the second language (L2), while the mother tongue is a person’s first language (L1).
Fishman (1977) on the strength of its primacy considers the first language as a ‘biological inheritance’ of a group’s identity. It is the first contact of the human person with the linguistic world. Therefore, it is the language that a person masters the most. This author enjoys communication in Urhobo and all the semantic sense it makes and appreciates. She would have enjoyed a career in aeronautics or cybernetics if she had studied science in her Urhobo, as her mother tongue.

All efforts, made and being made to teach science and technology in indigenous African languages are worth all the troubles that accrue from them. Children learn better and faster when instructed in their mother tongues. Thus the technological success of the G – 8 group of most developed countries is partly predicated on the effectiveness and functionality of their respective educational systems in which instruction at all levels of education is done in their mother tongues. The resolution on the Educational Policy of the Government of India observed that there is much experience to the effect that scholars who have been through a complete vernacular course are exceptionally efficient mentally (Krishnamurti, 2007). In 1917, a commission chaired by Sir Michael Sadler to review crucial educational problems reported in part that “it is thus beyond controversy that a systemic effort must henceforth be made to promote the serious study of the vernaculars in secondary schools intermediate colleges and in the universities. Krishnamurti (2007) also posited thus that “children coming out of such schools, where English is primarily the medium of instruction, have a poorer knowledge of, and exposure to, the mother tongue, which has made them culturally alienated and has stunted their cognitive development. Orode (2004), declared that the mother tongue is the first language of the learner, therefore, using it as a medium of instruction would facilitate learning and understanding more than the use of a second language, the lingua franca.

Having briefly highlighted the role of mother tongue in instruction and its primacy and functionality over the lingua franca in teaching and learning, we shall now consider the linguistic function of language transfer, and its application to the teaching-learning process in mother tongues. Language transfer refers to the process of using your knowledge of your first language or another language that you know when speaking or writing a language that you are learning. If the mother tongue is well employed in instruction, the learners can consequently transfer the
knowledge of their indigenous language into effective communication efforts in the lingua franca, especially in multilingual societies like Nigeria and India. This is even more important when we appreciate that the lingua franca is often not adequate as a socio-linguistic medium of communication. "The African states and India have multilingual and multi-ethnic populations which cannot be served by a single language as a lingua franca," noted Krishnamurti, (2007). There are much more socio-linguistic benefits for promoting the use of mother tongues in instruction.

Inversely, an instructor can transfer a mastery of the lingua franca into an effective use of teaching science in the mother tongue. Thus, the agency of language transfer is like a two-way valve; it is useful for the learner, who applies his linguistic skills in the mother tongue to learning in a lingua franca, and the teacher who employs the language skills in the lingua franca into teaching effectively in the mother tongue. It is pertinent to point out here that the effectiveness of language transfer in instruction and learning rests heavily on the mastery of the language of the linguistic divide and the ability to equate words without a corresponding loss in meaning. Semantic deficiency often results in language transfer on the part of the learner, who may misconstrue a concept, because of transfers in his or her own mother tongue, directly to a prevailing context in the lingua franca or language of instruction, which is not the mother tongue of the learner. A misconception or misunderstanding, which is predicated on a faulty language transfer, will cause a miscarriage of learning objectives and expected learning outcomes in science and technology.

The linguistic edge at the command of language transfer when applied to instruction in science is that the teacher can in the course of preparing her lessons, ensure that every concept and principle transferred is correctly reflected in the language of instruction. She can also make sure that semantics does not suffer any inaccuracies, even if syntax does. Syntactic rules could be broken, and communication may still be effective. But in the classroom environment, effective communication is the most important thing, rather than the consummate veneration of syntactic codes. For example, grammarians know that "adverbs of the productive class are in a one-to-one relation with adjectives, (Quirk & Greenbaum, 2000).
A teacher in science and technology, who is employing language transfer, may not have to prioritize syntax above semantics. Conveying meaning is the key factor in teaching. Like writing, teaching is also about making sense and conveying it to another. “It takes two to say a thing – a ‘sayer’ as well as a ‘sayee’, and the one is as essential to any true saying as the other”. Thus, the first requisite for any teacher is to know just what meaning she wants to convey and it is only by clothing these thoughts in words that she can think at all”, stated Growers (1970). Language transfer must therefore be employed effectively to achieve learning objectives in science and technology using the medium ship of mother tongues. If not so, the 1921 Report of the Departmental Committee on the teaching of English in England would apply. It says, in part, that: “what a man cannot state, he does not perfectly know, and conversely, the inability to put his thoughts into words sets a boundary to his thoughts... English is not merely the medium of our thoughts. It is the very stuff and process of it”.

**Techno - Linguistic Challenges Of Teaching Science In The Mother Tongues Of Africans**

African languages as mother tongues and not as lingua franca are seriously deficient in many areas, which explains why they are inadequate and ineffective as the language of instruction in science and technology. To start with, there is no indigenous African language, which is the official language of an African nation. Strikingly, English is the first language of about ten percent of the population of South Africa, but the second language of many others. African indigenous languages are therefore marginalized in the international socio-political realm of linguistic realities and existence. No African language is an international language, which means, Africa has no linguistic relevance in the international language arena. To be frank, it is only with a lingua franca that Africans are appreciated in the spheres of cultural linguistics. This reality implies that there are unique language problems inhibiting the internationalization of African indigenous languages, and consequently their employment as the medium of instruction in science and technology. It is these structural, intrinsic and functional logistic issues that have culminated into the challenges of teaching science and technology in the mother tongues in African. Prime among them is the issue of size. As mentioned earlier, the size of the vocabulary of a language is often determined by the scope of the cultural experiences and socio-cultural developments of its people. The complexities and exigencies of life which the European
societies experienced had been stupendous, and their societies have slowly evolved over the aeons from one experience circle to another, one dynasty to another, one civilization to another. But for most parts of African, it had not been so.

Agrarian societies would have their languages confined to agrarian and rural realities. As early as 776 B.C., the Olympic tradition had been well established, therefore a sport like Marathon became part of Greek culture. At this same time most Africans lived in the jungles, with a slow evolving agrarian culture and society. Indigenous languages lack the effective vocabulary equivalent of European words and concepts because of the residual gap in cultural and social developments between Europe and Africa. Even as items of cultural universals /diffusion penetrate and permeate the indigenous African culture in modern day Africa, laborious phrases have to be crafted by most Africans to describe common nouns. For example, the phrase, ‘the box of active or mobile pictures’ describes just the television. Some descriptions are fortunate to be short, like the ‘iron horse’ for bicycle; but many others are strenuous, just like ‘the canoe-that-moves-on-the-ground’, to mean automobile (car). Therefore, most of these mother tongues have not evolved socio-culturally enough to allow the coinage of new and technical words and their eventual acceptance into the mainstream of the indigenous African languages.

Another problem is that most of these languages are not systemized into linguistic codes and characterized by grammatical principles. Making sense by the speaker amounts to effective communication, and that remains true. Thus, the absence of an elaborate syntactic structure and linguistic dynamics makes the teaching of science in most of these African languages difficult and thus impractical sometimes. The concept of language transfer highlighted above, is very effective and rewarding in the case of European languages. It is very easy and effective to transfer English into French, because both languages are well structured syntactically. The rules of concord are strictly adhered to in English and those of conjugation in French. In English the subject-verb-object and predicate order is well established while in French it is subject-object-verb. So as the English speaker would say, “I love you”, the French would say, “I you love”, (Je t’aime). Therefore, knowing this structure in both one of two sets of languages would position the teacher to effectively translate, using the agency of language transfer, to create concepts and convey meanings adequately; but as most African languages lack this systemized syntactic
structure and background, they are inadvertently deficient as the language of instruction in intricate scientific and abstract concepts in technology.

A semantic appraisal of most African languages would reveal that a myriad number of loose and ambiguous sentences; the same sentence and phrase meaning different things in different contexts characterize them. This is because indigenous societies have their daily existence and cultural realities revolving around basic survival and the cultural diffusion with induction which reward culture and its language with foreign words is slow. So an indigenous language may remain the same for centuries. It is this narrow scope or this infinitesimal degree of language expansion that had defined the size of their vernacular vocabulary to be small, which consequently has made the language of indigenous societies to lack the semantic generosity for varied sentence constructions within a given conceptual framework. Of course there are proverbs and idioms used within social contexts in these mother tongues, but unfortunately, they are not well suited for teaching science and technology. In humanities and arts, these would suffice and make a lot of instructional sense, but in science teaching, it is not so. Thus to re-enact, the language of a people and society is a good measure of its socio-cultural development.

While still in college, Isaac Newton discovered the binomial theorem. Before he reached the age of 25, Newton had made three discoveries that entitled him to be ranked among the supreme scientific minds of all time (Downs 1956). According to this biographer, “first was the invention of the differential calculus, termed ‘fluxion’ by Newton... The calculus is involved in all problems of flow, movement of bodies and waves, and is essential to the solution of physical problems concerned with any kind of movement”. Newton lived between 1642 and 1727. At this time, no African boy of his age bothered about any thing outside basic survival – food and games. Newton had the guts to invent the word, fluxions’ to describe a mathematical concept that deals with variables and flowing quantities. This once again gives credence to the position that culture and language are inseparable, and that the language of a people is the social outcome of the cultural experiences and the challenges that ensued from such realities.

Newton was born into a culture that had already established the tradition of philosophic and scientific thought, so he could theorize effectively and was understood because the language he used as medium of communication already had the components of language that allowed him to frame his thoughts into scientific theory. Newton’s second major discovery was the composition
of light, which he did by subjecting white light to a prismatic separation. From this discovery, he was able to invent the reflecting telescope (Downs, 1956). Thus, the absence of such a tradition of learning and research in African cultures made its indigenous languages to be structurally and philosophically deficient to serve as an adequate and effective medium of instruction in science and technology.

Downs (1956) commented on Newton’s book, ‘Principia Mathematica’ that it is “a veritable reservoir of mechanistic philosophy, one of the most original works ever produced”. Thus European languages are products of sustained culture, values and traditions over millennia. The Swiss nation celebrated its 717th anniversary of nationhood, in August 1st, 2008. No African nation or culture has sustained its life that long. This serves to explain why most African societies in their discrete existential realities have not been able to sustain a socio-cultural tradition that could uphold the concepts of philosophy and scientific thought, which can be credited to the continent as African philosophy and scientific thought or tradition. Let us take a look once more at Newton’s famous law of gravitational attraction. It says in full thus: “Every particle of matter is attracted by every other particle with a force inversely proportional to the square of their distance apart”. This would have been taken as a message from the gods, and would have needed the grandest high priests and oracles to interpret it to the Africans during Newton’s time. Even when so interpreted it would be jargon or sounded like a foreign language to the indigenous people of Africa. This is because the culture and tradition of philosophy and scientific experimentation is alien to Africans hence their languages are bereft of scientific terminologies and coinages. As early as mid 16th centuries, Newton expressed the view that “the chief function of science is to carry out carefully planned experiments, to record observations of the experiments and lastly to prepare mathematical laws, based on the result (Downs, 1956). Africans apart from ancient Egypt did not care about the nature of things and causes of the effects that influence life on the physical realm of life. Newton as a product of such a culture posited further that: the proper method for enquiring after the properties of things is to deduce them from experiments”. The level of scientific or technical experimentations by indigenous Africans was very low, and not inspired by the quest for knowledge, but for hunger and mere survival.
In the Niger Delta region of Nigeria, are the Urhobo, an erstwhile indigenous nation, who lost their cultural purity first to the Portuguese traders and finally to Christian missionaries and British colonizers. The Urhobo are a conglomeration of twenty-two socially and territorially related polities. They live in a totaling 1,417 miles of land and there is an awareness of a common language and collective tradition among the Urhobo states, (Otite, 1973). A close up on the language of the Urhobo people, which is Urhobo, would expose its unsuitability for teaching science and technology. There is no existence, in the culture of the people, of the microscopic realities of atoms, cells, molecules and microbes like viruses and bacteria. Therefore, there are no Urhobo words that can equate them; as such a direct translation of these nouns and concepts is not possible, unless these words would be imported directly into the language. Ambiguity and amorphous use of words is another semantic problem facing the applicability of Urhobo in instruction in the sciences. In Urhobo language, there is no clear demarcation between concepts like ‘power’ and ‘force’; ‘spirit’ and ‘soul’. The ability to do things or the capacity to do a thing is understood to be power in Urhobo, which is ‘egba’, meaning power and strength at the same time. Force in technical or scientific terms does not have a vocabulary space in Urhobo. The nearest translation in Urhobo to the word force would be ‘power’ and when force is transmitted downwards is referred to as weight called ‘onye’. Gravity in this context can best be expressed as weight and not as a force. And the nightmarish experience of incubus and succubus by the Urhobo is also referred to as ‘onye’. Therefore to translate the law of gravity into Urhobo will be extremely cumbersome. Inertia as the residual force which opposes motion will be referred to by the Urhobo as reluctance, which does not convey its true technical meaning in relation to mass, friction and motion. Many basic concepts in physics, for example do not have their equivalents in Urhobo and several other African languages. Tension, which is force per unit length cannot be translated in Urhobo and still be able to retain its meaning as intended. More intricate concepts like the coefficient of friction, Planck’s’ constant in quantum physics, and even the concept of energy levels in chemistry have no linguistic space in Urhobo and other African languages as well.

The common noun and liquid of life, water, is not well defined in most African languages. It is often used ambiguously as the pivot of reference, when referring to other naturally occurring liquids. But in the English for example, water is distinct and even regarded on a higher level as one of the basic elements of nature viz: water, air, fire, earth. Most Africans would in their
mother tongues refer to tears as water. Amongst the Urhobo, it is ‘amerovie’ meaning water due to crying. Amongst the Hausas it is ‘ruwa’ – meaning water. Even semen in Hausa is referred to as ruwa, meaning water and in Urhobo’ semen is also termed water, ‘ameroma’, meaning water from the body or bodily water.

Just as Swahili is widely spoken in East Africa, Hausa too is widely spoken in the West African sub - region. The linguistic community of Hausa cuts across over half-a-dozen nations, spanning from Mali, Niger, Chad, Nigeria, Northern Ghana to Togo. It is therefore crystal clear that these linguistic cum socio-cultural and philosophic deficiencies which have made the Urhobo language ineffective for teaching is not peculiar to Urhobo, but a pan-continental situational reality. Thus the social and linguistic realities stand tall that African indigenous languages are deficient in structure, linguistic dynamics, and semantics as languages of instruction and research in science and technology because of the crucial absence of vocabulary equivalents, a dearth of scientific terminologies and experience, and an empirical philosophical base.

Truth is coming home to hunt Africans now, and this truism that these identified and related linguistic, socio-cultural and philosophical shortcomings, which have limited African indigenous languages, not only highlights the seeming impracticality of teaching science in the mother tongues of Africans, but resounds and embosses the position of English as the lingua franca of science and technology for Anglophone African nations. However the English people did not have their language to be so favorably positioned by chance or grace. They paid the price for it through the throes of imperialism, as the Romans colonized Britain for over 400 years and the official language of the Roman Empire which was Latin, diffused into the language of the English people. Meanwhile, a lot of Greek words, concepts and other aspects of culture had helped to shape the Roman way of life, thus the Greek - Roman socio-cultural influence facilitated the development of the English language as most words in English are Latin derivatives and others imported directly from the French and other European languages. Therefore, if African languages must be relevant and effective as the language of science and technology, then they must be allowed and made to evolve linguistically, socially, culturally and philosophically. Africans themselves have to rise up to this challenge, rather than expect Europeans to come and do this for them, the way Africans helplessly allowed its history to be constructed by Europeans.
Overcoming The Challenges Of Teaching Science in The Mother Tongue Of Africans Using The Tools Of Globalization

We have been able to identify a few of the challenges and their socio-cultural backgrounds, which make African indigenous languages ineffective in teaching science and technology. We shall now move from the theoretical realm to the more practical one by addressing the theme of our discourse, especially, which is to enhance the suitability of African indigenous languages for teaching science and technology through the application of the tools of globalization. A salient and pertinent question to ask would be, what are the tools of globalization? It will be expedient to take a cursory look at globalization before deliberating on its tools. Without an excessive use of words, globalization is the consummation of the futuristic ideal of a global village predicated on a high level of electronic communication, which was visualized by Marshall McLuhan (2001). However, it was also inspired by the twin ideologies of humanism and globalism both of which seek and promote the oneness of the human family, with the entire globe as an interactive village. Thus the process of globalizing socio-economic activities in a way that defies international barriers in the grace of communication technologies may simply be termed globalization. Babic (2003), defines globalization as “the process of economic integration of the world through free movement of: (a) ideas, (b) information, (c) goods, (d) factors of production: labour and capital”. The two main forces propelling globalization are information technologies and policies designed to eliminate the barriers to cross border economic activities. So far, the gains of globalization include greater human cooperation, advances in communication and information technology, promoting research and innovation across industries. This according to Babic (2003) “lowers the cost of cross-border transaction in goods, services and factors of production, leading to increased trade and investment and to higher incomes. In this way all countries could benefit from the process of globalization”. The tools of globalization are the computer and computer-based information. The Internet and communication technology are the prime tools of the process. And these world-changing tools can truly be employed to make the mother tongues of Africans useful as the language of instruction in the sciences. The computer culture is a global one. Even though Sanskrit and Hindi may be confined to India where such linguistic communities exist, the membership of the computer culture has the entire global space
as its location. Benson (2004) noted that technology has forever changed how we communicate with each other. And it is this change with the mindset of improving the suitability of the mother tongues of Africans in teaching science that this author, through this paper, desperately seeks. This pursuit and challenge demand the zealous approach and resilience of the Greeks to the quest for knowledge. We must endeavor to separate enterprise as the desire to make profit from this linguistic enterprise of developing African indigenous languages to be effective for teaching science. This appeal is inspired by the reality according to Raven (1972), that “enterprise may at different times be motivated by the desire to earn profits”. However, profit comes as a by-product, I am not against that. Therefore the desire and commitment to improve the suitability of the mother tongue of Africans by Africans as a medium of instruction should be our goal if we are concerned about the socio-economic growth of all aspects of the African continent.

The concept and constructiveness of teaching in mother tongue is not new. France and Britain blazed the trail in the 1920s in their respective colonies (Wushishi and Orode, 2004). This was not effectively implemented because the aim of the colonial education was to serve the European capitalist class in their exploitation of Africa (Rodney, 1986). In Nigeria, teaching in mother tongue was first experimented in the first school opened at Badagry in 1942 (Bamgbose (1976). The United Nations Education, Scientific and Cultural Organization (UNESCO) had thrown its weight behind the issue as it declares that “the best medium of instructing the child is his mother tongue or the language of the community of the child in the pupil’s first three years of primary education, especially with regards to science”(UNESCO, 1980). The child’s mother tongue remains the most effective medium of concept formation, concept grouping and concept transmission, posited Afolayan (1972).

These positions taken by educationists and scholars on the constructiveness of mother tongues in instruction were confirmed to be true and worth their weight in gold by the outcomes of the Ford Foundation Sponsored Ife Six Year Primary Project (ISYPSP). The purpose of the Project was to find out if the Yoruba child would be able to learn more adequately in the Yoruba language than in the English language at the primary school level, (Ojerinde, 1986). At the end of the investigative project, it was found that the pupils who were made to learn in the Yoruba language performed better than those who were instructed in English language. Based on this (ISYPSP) study, it was concluded that, if learning is to be made easier for the Yoruba child (orAfrican
children as a whole), and if schooling is to be made interesting, then mother tongue should be the language of instruction.

Having re-enacted and re-established the significance of instructing learners in their mother tongues, the challenge now and in this context is how to enhance the suitability of teaching science and technology in indigenous African languages in the current era of globalization. The thrust of this paper is how to use the tools of globalization to achieve this educational objective. The prime tool of globalization we have identified as the computer. African linguists and programmers in this era of globalization must synergize to be able to achieve the shoring-up of their mother tongues so as to be useful as the language of instruction in science. The first imperative, would be to apply the techniques and principles of language engineering which is a field of human knowledge that employs the use of computers to process language for industrial purposes. If the word ‘industrial’ is removed and replaced technically and conceptually with the word ‘linguistic,’ we would have the use of computers to process language for linguistic purposes. Such purpose will consist of upgrading indigenous African languages to enhance their effectiveness in teaching science and technology, so that programmes and packages can be devised and designed to enhance the orthography (as the system of spelling in a language) of African languages. Currently, the Microsoft word software programme is an orthographic masterpiece in language computing, as it automatically highlights errors of wrong spellings within the lexical reference of the English language. Thus any user of this programme enjoys a computer-aided correct – spelling faculty and facility. This same computing facility can be employed into the orthographical development of the various African tongues, and be used to erect a lexical base that would be useful in translating African languages into European languages and more importantly for creating word equivalents across the two linguistic divide of European and African languages. The challenge of being able to create equivalents of English words in African mother tongues, with the intent to facilitate teaching and learning science in these mother tongues, would be met by the effective application of glossematics, a term which refers to the ‘linguistic analysis according to the distribution and interrelationship of glosseme”, Advanced Oxford Learner’s Dictionary, (2006,). This linguistic engineering technique can be employed to create a langue for science and technology especially through the hybridization and articulation of glosseme, as “the smallest unit that signals meaning in a language”, (Ibid). These could be taken as root words, prefixes, suffixes and morphemes, which can all be linguistically
manipulated to create a language for science in the respective African indigenous languages. The word langue derives from the French to mean a language considered as communication system for a particular community, rather than the way individual people speak. This scientific/technical language would form a base as a hybrid language that would adopt indigenous languages to be effective for teaching science. This langue can be digitized lexically and employed in language engineering and language transfer techniques to enhance the suitability of African mother tongues for teaching science.

In the African cultural experience the realm of invisibility was reserved for the gods and spirits. Thus infinitesimal factors like electrons, viruses, bacteria, photons, ions and so on were absolutely unknown. Because it is such, the word or concept of invisibility is not enough to describe the many scientific principalities like photons, proton, electrons, viruses, bacteria, charges and so on. As such, translating such words from English or French would be frustrated by the non-existence of word equivalents. But a langue can be created in which units of African indigenous words can be anglicized and some English words Africanized at the rudimentary level of morphemes and glossemes. Therefore, an individual’s ability to perceive the world is conditioned by verbal language Devi, (2007). And this reality is true of the African language experience. The verbal language is limited because of the absence of an indigenous written form. As such translation and finding equivalent words in African languages to match European ones, will be ineffective. On the strength of this reality, Africans have no choice but to incorporate these scientific words that have no lexical equivalents in indigenous African languages into the mainstream and structure of the African mother tongue.

In this direction incorporation of foreign European words into the lexis of African languages will make use of the linguistic principles of hendiadys, which is the use of two words joined with ‘and’ to express a single idea, for example “nice and warm”. In such a linguistic stead, particle and matter can be made to reflect a particular idea as discrete when teaching or translating in physics to refer to the microscopic word of atoms and atomic particles. All of these linguistic realities can form the basis of research and operations of a language laboratory, where computer-engineering techniques, will help to digitize the lexicon of African languages, so that access, storage, retrieval and standardization of these materials can advance these relatively unevolved African languages.
The part of phonetics that is concerned with stress and intonation, known as prosody, can be applied, using the computer, on the teaching of the verbal part of language to achieve the effective teaching of science in African languages. Various soft wares and programmes can be designed to enhance the prosodic value and effectiveness of Anglicized, Africanized, and adapted words, so that meaning is not lost or misconstrued, and learning outcomes do not suffer miscarriage.

These linguistic principles are essential in the verbal interpretation of texts and concepts, especially to retain meaning within a contextual framework. Even paralinguistics as relating to communication through ways other than words, for example, tone of voice, expressions on the face and actions. The information communication technologies of multimedia production can also be employed in the teaching of science and technology in mother tongues through the application of paralinguistics to make meaning clearer. A concept which is difficult for an instructor to explain, because of inherent linguistic gaps can be made easier to impart using the technological teaching aids of the multimedia format. ‘A picture saves a thousand words’ says a Chinese proverb. Thus, the computer based multimedia facilities can help to bridge the linguistic gaps, which are limiting the teaching of science in African mother tongues.

The globalization occasioned new vista of business and knowledge-sharing, the faculty of e-books, (electronic books) can be built upon by Africans to create e-dictionaries of African languages, as a way of not just globalizing the mother tongues of Africans, but also an opportunity to blend other cultures into it through a more embracing international acceptance of African languages, forging linguistic identities and consequently African languages will also play their role in the quest for world peace. The e-dictionaries will have their economic benefits for their creators, which will stimulate and facilitate further research into African language development and suitability for teaching science and technology.

Mother tongue research and development initiatives are to be triggered so that translation, interpretation, digitization of ideograms, and constructing a database will serve the information needs of teachers of science in African languages. These language development responses can be harnessed to the Internet to promote research, socio-linguistic relevance of African languages, development and application in other institutions of society apart from education. In this era of globalization a new culture is gradually emerging, the culture of greater inter-human and
international cooperation. The language of globalization is not English, just as English is also not the language of science. The language of globalization is freedom, the freedom for capital, ideas, and culture to move across international borders. And with the tools of globalization, African indigenous languages must move upward into the global arena and contribute to human knowledge, progress, cooperation and world peace, especially as it is a truism that culture has no other expressive but language, that the two are one and the same. Therefore, the globalization of African indigenous languages is as good and imperative as the globalization of African indigenous cultures.

Conclusion

The role of language in human cooperation and social existential realities cannot be overemphasized especially as the main communicative agency in human experience is language. In the social realm of Africans, language has played its role in an indigenous capacity, as a hub of inter-human interaction, a symbol and bond of unity, and an emblem of cultural identity and a transmitter of culture from one generation to another.

However, with the advent of Western/European education, African indigenous languages became stranded on the shores of lexis as they lacked the semantic and syntactic capacities occasioned by a dearth of philosophic and scientific tradition in these African cultures. As a result, African languages found themselves deficient as the language of science and technology. This author in this presentation has refused to accept that English is the language of technology. Rather than any such conclusion, this paper is asserting that all efforts can and should be made to upgrade African indigenous languages in order to make them suitable for teaching science. The non-English speaking members of the G – 8 have excelled in science and technology not with the agency of the English language, but by the use of their respective mother tongues. This truism further embosses the importance of teaching science and technology in the mother tongue of the learner.

Conclusively, the functionality and mutual rewarding benefits of teaching science and technology are great and crucial to national development. And in this era of globalization, language can be used to broker peace, as the tools of globalization not only enhance human
cooperation and consequently peace but also can effectively be employed or applied to enhance the suitability of African indigenous language in the teaching of science and technology.
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