

LANGUAGE MISCONCEPTIONS IN SCIENCES: A CASE FOR THE USE OF MOTHER TONGUE

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Abstract

There are myriads of methods and research findings on how to put across to the learner science concepts as to make the learning of science meaningful and result-oriented. However, these methods sometimes fail to achieve the desired objectives due to faulty conceptions or misconceptions arising from language of instruction. This paper therefore looks at language based misconceptions in science and the use of mother tongue to remedy the ugly situation if we are to move forward in science and technology in the 21st century. The use of mother tongue in science instruction is advocated and suggestions to remove the likely inherent problems associated with such use are proffered.

Introduction

The general realization and acceptability that the contemporary world we live in today is a world of science and technology is an incontrovertible fact. (Onyesoh, 2001; Abujara, 2002; Ihuarulam, 2002; Eniayeju, et al 1999). Through the ingenuity of science and technology the extensive and large world has been reduced to a small village. Science, Technology and Mathematics (STM) has been the bedrock of all facets of human development (Alio, 2003; NPST, 1996). As an integral and essential part of the world's culture, it will then be catastrophic for any nation/community to overlook science and its advancement in the 21st century and even beyond this millennium. Emphasis on Science and Technology

The adoption of science and technology in national life marks the difference between developed and underdeveloped world (FMST, 1987). The economic status of a country is simply the reflection of its scientific and technological development. This has been the basis in classifying nations of the world as developed and developing, "the wealth, influence and power of any nation in the world today depend on her capacity to utilize science and technology for socio-economic development" (Emevon, 1985 cited in Ajagun, 2001). Asimor (1980) emphasizes that "unless we continue with science and gather knowledge ... we will be buried under our problems". Corroborating this statement, Dienye (2001) cautions that Nigeria should not afford to be left out in today's world of science and technology. In the light of these, Bajah (1978) has opined that "for any citizen to live good life he must be aware of science and he must be taught to believe and think scientifically without being necessarily transformed into a scientist". It then behooves on us that we need to keep pace with world's development and advancement in science and technology. If the above truism will be overlooked by any, it will be to the peril of such an individual or nation.

In the same vein, Jegede (1996) warns that the presence of excellent understanding of scientific and technological concepts in our children in order to attain our personal and societal goals in the 21st century and even in the several generations to come could be a mirage, hence, a blurred vision and unaccomplishable mission.

The emphasis placed on science and technology by our rational policy makers at all levels of the educational system is of note in this discourse. For instance, the Nigerian government has proclaimed that a greater proportion of expenditure on university education shall be devoted to science and technology. It also advocates that not less than 60% of places in students admission should be allocated to science and science oriented courses in conventional universities and not less than 80% in the university of technology (FGN, 1998). While at the polytechnic level, admission into the technology and business courses should be weighted in the ratio of 70:30. Also, at the secondary school level, secondary education should provide trained manpower in the applied science, technology at sub professional grades (FGN, 1988).

Although science and technology education programmes have been seen as a means of achieving scientific and technological development, these much desired goals are still farfetched Akinola (2004a).

This is so because according to Afoloyan (1988) the effectiveness of any educational programme is measured by the level of its relevance to the community which it is offered. Any educational programme that is not meaningful and practicable to the learners cannot be relevant.

The inability of science students in Nigeria and indeed elsewhere to benefit maximally from the science education programmes could be attributed to misconceptions especially language-based misconceptions (among other factors) (Eniayeju and Eniayeju 1994, cited in Akinola, 2004b).

It is of the opinion of Okebukola (2002) that the problem of transmission of science (communication) could be in the subject matter, the learner, the learning environment, the culture where Science learning is taking place or the science teacher. The problem of misconceptions is therefore multidimensional issue.

Concept of Misconceptions/Meaningful Learning

It is universally accepted among those who study human learning that humans begin construction of meaning at birth and rapidly accelerate the process as they gain the capacity to use language to code meanings for events and objects around them (Novak, 2002).

He also emphasized that the construction of meanings naturally leads to concept formation or conceptions. Concepts are also seen by him as "perceived regularities in events or objects or records of events or objects designated by a label (usually words)". The construction of meaning which leads to concept acquisition is an idiosyncratic process. It could be faulty, limited or invalid and can distort or impede meaningful learning of universally accepted scientific truths, ideas, beliefs and norms hence leading to misconceptions.

For some decades now science educators and researchers have shown much concern over faulty conceptions among science students. These faulty conceptions simply depict students misunderstanding of ideas or views. Such views or ideas are not in conformity with accepted scientific views. Some call them 'preconceptions' (Novak 1977). Driver and Easley (1978), Nakhleh (1992) refer to them as alternative conceptions or framework. Sultan (1980) calls them children's scientific intuitions. Gilbert, Watt and Osborne (1982) prefer the term "children's science" while Teichert and Stacy (2001) choose the term "misconceptions"¹. All these terms and still many others represent (the various perceptions of the faulty conceptions in sciences. In this discourse they will be seen as conceptions or concepts that are not congruent with what scientists currently believe irrespective of source or origin.

In the opinion of Novak (2002) each of these terminologies or labels has merit, but each also has its limit in description of the origin of the problem; hence he suggests the acronym (LIPH) limited or inappropriate propositional hierarchies depicting the origin of the problem which is linked to non-meaningful learning.

Building upon the ideas of David Ausubel (Ausubel, 1963; 1968, 1978; cited in Novak, 2002); scholars have shown a clear distinction between rote learning and meaningful learning. The idea of meaningful learning connotes a situation where "the learner chooses conscientiously to integrate new knowledge to knowledge that the learner already possesses (Novak, 2002). It involves substantive, no arbitrary incorporation of concepts and propositions into cognitive structure. This is opposed to overwhelming emphasis on rote memorization and verbatim recall of answers which learners often use to achieve high grades. Unfortunately, most of this knowledge soon becomes irretrievable from long-term memory and even if recalled, seldom can the learner utilize the knowledge in new context as in novel problem solving. One of the basic goals of science instruction is to enhance understanding of students in the subject matter. Students are expected, to utilize such understanding in new context and novel problem solving. Meaningful learning in sciences is very elusive if various forms of misconceptions, especially language-based misconceptions, abound without conscientious and deliberate efforts to eradicate them.

Forms of Misconceptions

Misconceptions in science can be classified according to origin or sources. They can be categorized as pre-conceived notions, nonscientific bell- . conceptual misunderstanding, factual misconceptions, and vernacular misconception. These are collaborated elsewhere (Okebukola, 2002). Other sources of misconceptions could be attributed to the cognitive structure, gender primitive

factor, mathematical ability and language (communication) which could be said to be central to all. forms of misconceptions, for communication is necessary in teaching and learning.

The most significant factors for the poor learning of science has been identified by many researchers to be language based misconceptions (Adebinpe, 1998; Ajayi, 1998; Olayede, 1998 and Akinola, 2004a cited in Akinola, 2004 b) He contends that if "the language competence of a child imposes a linguistic handicap on him/her, the expected learning outcome will always fall short of the input". Basically, there are two forms of

language based misconceptions. Firstly, English language is the official language of instructions in Nigerian schools and most science students do not have good command of English language.

Lack of proficiency in the English language, according to Obemeta cited in Akinola (2004) has, serious effects on the ability to read, think and write quickly as the instruction is in English Language i.e. misconception as lack of proficiency in English language. Again most science students are very deficient in the language of science, scientific 'Jagons' i.e. terminologies. According to Eniajeju and Eniayeju cited in Akinola (2004 b), language of science presents difficulty from two angles: Unfamiliar technical words and misconceptions. They also contends that an alarming number of English words are understood as having the opposite meanings by 12-14 year olds even in Britain. For example 'a volatile compound' mean at least four things to as many students. This is because the word volatile compound has left the realm of science with its meaning 'easily vaporized' and entered every day conversation where it is applied to markets, people, countries, etc. It then creeps back into science with misconstrued meanings which to many students are not out place but nevertheless makes a nonsense of a science discussion, A volatile compound is understood as "flammable, explosive, unstable, and dangerous compound".

A Case for the Use of Mother Tongue

The case for the use of tongue in teaching science in our schools has been long advocated by many scholars and researchers. There has always been argument for and against the idea. However, it should be noted that the primary medium of any educational programme is language and it is when a language adopted is the one most available to the learners that the content of education can be made meaningful, practicable and immediately relevant. There is always a strong link between what learners learn in school and the various experiences they are exposed to in their environment if the language of instruction is the same with the language used at home or in the environment. The dissonance between the school experience and the home is eliminated if language that is not foreign to his culture is used as medium of instruction in school including the teaching and learning of science.

The abysmal poor performances of the science students in both internal and external examinations, non-utilization of science to solve everyday problems and lack of scientific literacy have been attributed by many researchers to the use of only English language as a medium of instruction in science teaching and learning. Busari et al in Akinola (2004 b) observes that "more often than not, pupils have to struggle between comprehending the English language and learning the science content". This leads to what they term as 'limited interaction and subsequent learning difficulty'. One (hen wonders the type of learning that is taking place when the language of instruction is foreign to the learners and scientific concepts are absent in the learners' own language or culture. Afolayan (1989) posits that the educational programme in Nigeria has never been properly development oriented due to the wrong utilization of languages in Nigeria for educational purpose. Fafunwa et al (1989) have demonstrated that primary pupils who were taught in their mother tongue (Yoruba) performed better than their counter parts taught in English. Also, Igwebuikwe, Ajuara and Odili (1997) show that secondary school students in Warri, Delta State, who were taught Biology in Pigin English showed significant improvement (Pigin English is commonly spoken in Warri). Orji and Orji also demonstrate that students perform better in physics when taught in Ibo language.

Bello (2003) reports that researchers in Africa and elsewhere have provided overwhelming evidence of the significance of mother tongue in schools. For instance, it was found that the mother tongue could be neglected only with adverse consequences in South Africa. This is also true of our nation.

Bamgbose (1991) is of the opinion that the use of mother tongue will enable the learner to grow and develop with linguistic knowledge of their environment. Yar'adua (1999) also affirms that mother tongue provides the conceptual substances on which a child builds new thoughts and learns to organize his environment and relate himself to it.

Science has a lot to do with the environment especially in concept formation, if mother tongue is properly harnessed, the reasoning of the learners will be sharper in the process of learning science.

Problems

Akinola (2004a) has identified the following major problems militating against the use of indigenous Nigerian languages/mother tongue as medium of instructions in science education.

- The multilingual and multi-cultural nature of Nigeria.
- Non-availability of science textbooks and other instructional materials in indigenous Nigerian languages.
- Lack of trained science teachers that can use indigenous languages to teach science.

- The heterogeneous nature of some Nigerian cities which makes it difficult to adopt a single Nigerian language for the purpose of instruction in schools.
- Non- standardization of scientific terminologies in Nigerian languages.

The problems could also include nature of scientific concepts. Some of the concepts do not present themselves for selective observation e.g. quantum, electron, bond, energy, photons, scalar, atoms, molecules etc.

The issue of which one of the three major Nigerian languages (Ibo, Hausa, Yoruba) should be adopted as National Language also is a problem.

Attitude of children and even parents towards the learning of their first language i.e. the effect of neo-colonialism on Nigerians makes Nigerians feel that to speak English (which most of the time they have no good grasp of) is better than the indigenous one.

The Way Forward

Having X-rayed the two sides of the coin in the case of mother tongue (indigenous language) as medium of instruction in science teaching and learning, the following solutions are posited to take care of the likely problems in the use of mother tongue, in order to enhance meaningful learning, remove language based misconceptions and forge ahead progressively with the rest of the world in science and technology in the 21st century and even beyond:

- a) A project to be called the National Science Language Project (NSLP) should be put in place. Here, the NERDC, Federal Ministry of Science and Technology, the national institute for Nigerian languages (NINLAN), STAN, SAN, The Association of Nigerian Languages Teachers, university dons, the Nigerian language experts and other stake holders should be assembled. Their job should include, among others,
 - standardization of scientific terminologies in Nigerian languages;
 - translation of existing popular science textbooks into Nigerian languages, and
 - writing and providing new books and instructional materials in various indigenous languages studied in various institutions of higher learning.
- b) A course in science education/methodology emphasizing the use of indigenous languages in the teaching of science should be introduced and made compulsory at both NCE and degree programmes of our tertiary institutions,
- c) Short-term courses should be organized for the serving science teachers on how to teach science in indigenous languages after the NLSP has been fully articulated and put in place.
- d) Government should ensure that all the book materials and other instructional materials developed from NLSP should be produced in enough quantities.
- e) The learning of mother tongue and other indigenous languages should be further encouraged at all levels of our educational system.
- f) The indigenous language(s) commonly spoken in a given area should be adopted for science instruction and should be used in conjunction with English to solve the problem of heterogeneous nature of some Nigerian cities and that of multilingual and multicultural nature of Nigeria.

More, funds and facilities should be provided to colleges of education and universities for effective learning of indigenous languages vis-a-vis national science language programme.

Conclusion

Grant (1964 in Bello 2003) argues that "the child's views and thoughts are in his own nature language". He should be encouraged to think for himself since it is only the learner who can choose for himself to learn meaningfully, consciously and deliberately. If he does so especially in a language he is very familiar with and can easily relate scientific concepts, faulty concepts (i.e. misconceptions) as a result of language will be expunged.

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