28 PRIMARY SCIENCE IN THE UNIVERSAL BASIC EDUCATION: WHICH MEDIUM OF INSTRUCTION?

S. O. Banjoko
Faculty of Education,
Lagos State University.

Abstract

This paper reviews existing literatures in the appropriate medium or media of instruction for teaching and learning of primary science at the primary school level. The paper notes the controversy generated by the adoption of the language policy of the National Policy on Education (1981) at the primary school level. The paper then suggests a re-examination of the Language Policy with the view to adopting Bilingualism as the medium of instruction at the lower classes of the primary school in the teaching and learning of primary science.

Introduction and Background to the Study

In recent times, several educators have advocated the need for the use of mother tongue as a medium of instruction in Nigeria primary schools. (Fafunwa, 1990; Gilmor, 1990; Eshiet, 1991; Madu, 1991; Mc Naughty, 1992).

Being a first language of the learner at that level, it is not surprising that many people in the education field have often called for the use of mother tongue as a medium of instruction which they claim is likely to facilitate better learning and understanding than the use of second language such as English (Fafunwa, 1990; Bajah, 1988).

In what would appear to be a response to the call for the use of mother tongue as a medium of instruction, the Federal Government of Nigeria reiterated in the National Policy on Education (NPE) (FGN, 1981) on the medium of instruction that;

"Government will ensure that in the pre-primary school the medium of instruction will be primarily the mother tongue or the language of the immediate community."

"Government will see to it that the medium of instruction in the primary schools is initially the mother tongue or the language of the immediate community and, at a larger stage, English.

With the above policy statement the implementation of which is meant to

enhance primary education practice in Nigeria, two media of instruction at that level are recognised namely mother tongue and English. It would be interesting and informative to examine precisely within the context of improving the quality of science education at the basic level, the extent to which this policy statement and its implementation is affecting pupils performance in science at the basic level. The question therefore is: What implication, if any, has this policy statement on medium of instruction for pupils' performance in primary science? In other words, to what extent is the language of instruction affecting or likely to affect pupils science achievement at the basic level.

Mother Tongue and Science Learning:

Several researches and evaluation studies in Nigeria have been carried out on the use of mother tongue in the teaching and learning of science as well as some other school subjects (Fafunwa, 1990; Inyang, 1991; Ajokwe, 1991; Ogbeje, 1991; Ibude, 1991; Olanrewaju, 1991; Bajah, 1988). One of such large longitudinal studies in Nigeria is "The Six-Year (Yoruba medium) Primary Project" at the Universities of Ife (now Obafemi Awolowo University) Ile-Ife, Nigeria. The objectives of the Ife six-year mother tongue project, among others, include the development of curriculum materials together with appropriate methodology for the teaching of primary school subjects using Yoruba language as the medium of instruction.

The main idea behind the project was the need to demonstrate that education at the basic level, precisely, at the primary level when given in child's mother-tongue rather than in a foreign language is likely to be better understood, more effective and meaningful to the learner. Yoloye (1972) first evaluated the Ife six-year project and the result shows that primary school pupils (primary one to six) who studied science and mathematics in Yoruba (mother tongue) performed better than their experimental counterparts who learnt in English.

The language policy as stated in the National Policy on Education (NPE) on the use of mother-tongue as a medium of instruction has generated considerable controversy among several highly respected intellectuals as well as the general public. Those who support the policy claim that a child learns best in his or her mother tongue. The policy, therefore, would promote greater comprehension of school subjects by the pupil. With respect to science at the primary school level, Fafunwa (1990) in support of the policy, claims that primary school pupil who studied science and mathematics in mother tongue performed significantly better than their counterparts who studied in English.

Those who oppose such a blanket policy, on the other hand, claim that it would

limit the scope of the child's knowledge especially in Science, Technology and Mathematics (STM) where words representing scientific concepts are not available in the Nigeria mother tongue or their mother tongue equivalent (Umeodagu, 1990). It is also claimed that since the child would eventually learn science in English at the higher levels of education, the use of mother tongue at the beginning might constitute a handicap or even interfere with the child's proficiency in English in later years. Viewed objectively, one is bound to admit that there are some technical and pedagogical problems particularly in science, technology and mathematics (STM). Secondly, in order to use any language as a medium of instruction for science, technology and mathematics (STM) and other school subjects, there must be textbooks in these subjects written in the languages. Today, few of the Nigerian languages have textbooks written in them. Third, from a pedagogical point of view, there are sometimes conceptual problems in the mode of thought used to express concepts in English and in Nigerian languages. For example, in Arithmetic in the English language, it is easy to conceptualise the number 56 as five tens and six units. In Yoruba language, on the other hand, 56 is conceptualise as three twenties minus four.

These are some of the problems that have been highlighted and attempts have been made to address them. According to Yoloye (1986), government has tackled fairly vigorously the problem of orthographics for Nigeria language through the language development center of the Nigerian National Educational Research and Development Council (NERDC). The center has already produced orthographics in thirty Nigerian languages in six manuals as follows;

Manual I:	Hausa, Efik, Igbo, Yoruba.
Manual II:	Edo, Tiv, Fulfude, Kanuri, Izon.
Maual III:	Ibibio, Nupe, Berum, Idoma.
Manual IV:	Ebira, Igala, Isoko, Kaje (Baju), Gbagye (Gwam).
Maual V:	Biraye, Esau, Bura, Ikwerre, Urhobo, Wukari.
Manual VI:	Lokaa, Mbembe, Obodo, Tarok, Igede, Mumuye.

In general, the glossaries contain both English and mother tongue equivalent for words grouped into Mathematical, Physical Science and Biological Science terms.

A close study of the glossary shows that the terminologies were developed according to the following guidelines (Bajah 1998):

i Direct borrowing of words from a foreign language, sometimes with slight changes that conform to the pattern of the language. For example, the Yoruba

word for science is 'sayensi', the Edo word for graph and electricity are 'egiafu' and 'eletiriki', the Efik word for insect is 'insek', and the Igbo word for force 'fosi'.

ii Coinage or invention of a completely new word in the Nigerian language to express a new idea or concept.

iii Adoption from another language when a suitable word does not exist in one language e. g. onion in Yoruba language is 'alubosa' and in Igbo is 'alibosa'.

Production of the textbooks have been proceeding quite as rapidly (Yoloye 1986).

The Nigerian Educational Research and Development Council (NERDC) has produced textbooks based on the new curriculum for the three major languages for primaries one to three.

The solutions enumerated above have not entirely convinced the critics of the use of mother tongue as a medium of instruction in science, technology and mathematics, hence the controversy still goes on.

Primary Science Projects and Medium of Instruction

According to Bajah (1988), the first major attempt at curriculum development conference in Africa in which Nigeria participated was conceived in 1960 in Rehovot, Israel. The conference came up with mutual agreement to explore the potential application of modern curriculum development techniques to the educational needs of Africa. An initial conference held at Massachusetts Institute of Technology (MIT), Endicott House in 1961 was attended by 79 participants of which fifteen were Africans. African Primary Science Programme (APSP) was evolved from this conference in which Nigeria actively participated. Furthermore, Bajah (1988) states that there was the attempt to develop primary science programmes by the then regional ministries of education in Nigeria in the mid sixties. One such attempt, according to him, came to fruition in the then Bendel state of Nigeria under a contract between the state government and United Nations (UN).

In 1966, participants at a workshop on primary science included Ministry of Education officials from various parts of Nigeria, University lecturers from science and education faculties, selected secondary school teachers of science and selected primary teachers from Lagos, East, North, West and Mid-West. The objectives of this workshop, according to Bajah (1988), were

1. to develop science units that will be suitable to the Nigerian child by taking into account the child, his environment and the teacher.
2. to construct inexpensive equipment from local materials.

3. to develop a 'science package' which will include texts for teachers and pupils equipment and any other aid that will promote effective teaching and learning.
4. to test and re-test the units in a number of primary schools, consider feed-back and re-write the units in the light of new experiences.
5. to train the teachers who in the final analysis will decide the fate of the units in the classroom.

The commission recommended, among other things, that the use of native language as medium of instruction in primary schools should be examined.

Other related studies have been carried out in other parts of Nigeria. Ojo (1990) conducted a study on mother-tongue instruction and pupil achievement in primary school science with particular reference to soil, human body and movement. The results showed that the students in the mother-tongue class performed better than the students in the English class when tested in practicals. Teachers view on the use of mother-tongue as a medium of instruction has been examined by Enukpere, Alimore, Alimoene (1990) who found out that serving science teachers generally have more positive views about the use of mother- tongue than English as a medium of instruction in Nigeria primary schools. Inoemiesan (1990) also sought pre-service and in-service teachers' perception about the teaching and studying of chemistry in the mother -tongue and found out that teachers are willing to teach and study chemistry in their mother -tongue.

Students attitude towards the use of mother-tongue has also been positive as exemplified in Adeniran's (1990) investigation on "the effect of teaching mathematics in mother-tongue on the attitude of the learners". The result revealed that majority of the students had positive attitude and appreciated being taught in mother-tongue.

However, it is necessary to mention that not all researches carried out on the use of mother-tongue as a medium of instruction have supported the view. Ogbeide (1988) in his study on the need to adopt mother-tongue as a medium of instruction addressed the implications for the learner. The results indicated, among others, that English language is a more effective medium of instruction than mother-tongue.

The review of literature on the use of mother-tongue as a medium of instruction in Nigeria will be incomplete without referring to some studies (Ato, 1991; Akpan, 1991) that have identified some technical problems with respect to science teaching and learning. Ato (1991) looked at the issue of teaching science in mother-tongue in primary schools and its curricular implications. He cited the teaching of Biology in Tiv language as an example to illustrate the problem. He mentioned that appropriate mother-tongue based science nomenclature for organs such as pancreas, duodenum,

appendix, and differentiation in the stomach compartment of polygastric animals are lacking. He recommended the development of appropriate vocabularies for the teaching of science, technology and mathematics in various Nigeria languages.

The language policy as stated in the National Policy on Education (1987) has also been reviewed. Ajokwe (1990) examines the implications of the language policy for the learners particularly at the pre-primary and primary schools in Nigeria with reference to science and mathematics learning. She argued that, although instruction in the mother tongue may be desirable and attractive, it is likely to create more problems than it is likely to solve for the learner especially in a country like Nigeria where the use of one national lanuguage (Lingua Franca) is a very sensitive issue. Akale (1991) also re-examines the mother-tongue education policy as proposed in the National Policy on Education. He draws attention to the importance of the mother-tongue as a medium of instruction and concludes by stating that while the policy is a good one, it is of course a daunting task in its implementation.

In summary, the policy on the use of mother-tongue in Nigeria as a medium of instruction has generated considerable controversy and the debate, both within and outside the education circle, is still an on-going process.

In other parts of the world, various studies have also been carried out on the use of mother tongue as a medium of instruction.

In Kenya, Waweru and Seddon (1987) carried out an experiment on the transferability of scientific concepts taught in different local languages for Kenya students in the primary school. Specifically, the experiment set out to investigate whether scientific concepts that were learned in English, Swahili or Kikuyu by multilingual Kenyan secondary school students can be transferred to any one of the languages. Students were randomly assigned to be taught in one of the three languages or to a control group. Control group students were taught chemistry lessons in English and Swahili/Kikuyu which consisted of mainly worksheets and practical work in those languages for three consecutive weeks. It was found that while all three experimental groups performed significantly better than the control group, there were no significant differences in the performance between the various experimental groups. This suggests that transfer can be effected from English to both Swahili and Kikuyu.

Mac Naught (1991) investigated the hypothesis that "language difficulties experienced by Zulu students learning Chemistry in secondary schools in English can be overcome if the learners were taught in Zulu". Two, experimental groups were adopted namely Zulu and English. Discussion method was used and the result indicated

that students learning chemistry in Zulu performed significantly better than those who learn chemistry in English language. He recommended that Zulu language and other recognised South Africa Languages (mother-tongue) should be adopted as language of instruction in South African Schools.

In Papua, New Guinea, Marshal and Gilmour (1990) looked at the words and concepts that students found problematic in physics in secondary schools. Over 2000 students in Papua, New Guinea, ranging from grade 7 to university levels were tested for comprehension of these technical and non-technical words in science classes in mother-tongue and English (second language). The results showed students found many of the technical and non-technical words easier to understand in the mother-tongue equivalent.

Waiti (1999) seems to support the use of mother-tongue in science education instruction among Maori children in the primary school. He describes how, in the past, education in English has failed the Maori children of New Zealand and how this failed policy has led to the resurgence of interest in Maori language as a medium of instruction. The Tereomarori language has now evolved to be used to teach modern and scientific concepts.

Otuka (1991) looked at the implementation of the use of mother-tongue as a medium of instruction in primary schools in two countries namely Srilanka and Wales. The study revealed that the experiment in the two countries were success stories. In addition, Whittle (1991) in Lesotho looked at language in mathematics and science in an attempt to identify key technical words in various science topics such as energy, force, and so on and translated these key technical words to the local languages in an effort to help teachers become aware of the issue surrounding the learning of science in local languages and English language (as a second language). He advocated for the use of local languages for science instruction for greater comprehension.

The review of literature so far on mother-tongue or local languages and science learning show that there is a global trend in the use of mother-tongues as alternative media of instruction.

Bilingualism and Learning

Although, evidence has shown that children taught in the Ife six-year project made substantial affective gain in respect of adjustment to school and personality characteristics (Fafunwa 1990), further researches (Roach, Smith, Vazuer 1990) also indicate that in some cases bilingualism seems to significantly improve pupils performance in Nigeria and some other countries.

Roach, Smith, Vazquer (1990) compared the performance of bilingual and monolingual children in urban schools in Wales, making use of recognized intelligence and achievement tests. The result showed that the bilingual child was able to derive the same intellectual advantage from the school as the child who used one language for science learning. Further researches in the United Kingdom (Roach, Smith, Vazquer 1990) did not show bilingual children as inferior to monolingual children in the learning of science related subjects. Roach, Smith, Vazquer (1990), experimented with Welsh science related concepts. These researchers found that bilingual children from rural areas were distinctly not inferior to monolingual English-speaking children in the same area, but there was practically no difference between bilingual and monolingual children in urban schools. Roach, Smuth, Vazquer (1990), gave a non-verbal test in some science topics to 10-year-old primary school pupils in Wales, who were divided into bilingual and monolingual groups respectively. The main difference in Intelligence Quotient (IQ) was found to be 8 points in favour of the bilingual.

Veiga (1989) obtained clear evidence that bilingualism was not deficient to monolingualism in the learning of some science topics. Veiga therefore suggested that bilingualism be used for teaching some science topics to non-white pupils in United Kingdom in order to cope with certain segments of their environment. In his own study, Stark (1977) concludes that early acquisition of a second language at school does not necessarily weaken the home language but may strengthen it. And Jones (1979) discovered a slightly significant difference in both verbal and non-verbal tests between bilingual and monolingual children in favour of the monoglot group, but when the verbal scores were adjusted to a common non-verbal basis, the difference disappeared.

However, more other studies (Clauge, Lawor, Saidi 1988; Cleghorn, Merrit, Abagi 1989) in Europe and Africa show that Bilingualism is facilitative in enhancing performance particularly in science and science-related subjects. Clauge, Lawor, Saidi (1988) looked into ways of improving and encouraging science observations and activities through bilingualism among children in East London. The sample for the study comprised 5-6 year-old bilingual children. Care was taken to give equal status to many languages encountered in the class. The results showed that teachers of 5-6 year-old bilingual children used stories ("Language in context") to initiate science observations and activities. Futhermore, Cleghorn, Merrit and Abagi (1989) carried out a research in social studies in standard 8 classes of three Kenya primary schools. One was an urban school where English was the medium of instruction from the start (school 1), the second was a peri-urban school where English and Kiswahili were used initially as the medium (school 2) and the third was a rural school where vernacular, Luo, was the initial medium (school 3).

In the first two schools, most of the upper school instruction was in English, but in the third Luo was used quite freely to give explanations contrary to official government policy which stipulates that English be used at the upper level. The results showed that school 1 made little reference to everyday examples. By contrast, schools 2 and 3 made reference to cultural relevant examples in helping to establish the meaning of science.

In the final rating, school 2, where English and Swahili (bilingual) were used, was rated first followed by school 3 (where Luo, the local vernacular was used), and lastly school 1 (English medium).

In Nigeria, Ala (1983) investigated the effectiveness of the three alternative languages (Yoruba, English and Bilingual) on the learning of "family living" in social studies. She found bilingual to be more effective than the use of either the mother tongue alone or English language alone in Primary Two. Ande (1990), in a related study, investigated the learning of Piaget's conservation paradigm among primary two pupils. Three alternative media of instruction were used namely English, Yoruba and Bilingual (Yoruba and English) media. The result showed that pupils in the bilingual medium group performed significantly better than those in the other two media groups. She attributed the differences to the fact that the bilingual media group had the opportunity of using two languages, which facilitated the learning of Piaget's conservation paradigm effectively. She attributed the findings to the fact that bilingual pupils have opportunity of switching from mother-tongue to English when necessary to obtain meaning of the Piagetian concepts.

In the light of the literature reviewed and discussed so far, it would be seen that there is clearly a linkage between the quality of learning science and other school subjects and the medium or language of instruction used, whether mother-tongue, bilingualism or English as the case may be.

Banjoko (1988) found out that the Bilingual medium of instruction is the most facilitative in the attainment of the primary science concepts that describe attributes or properties and have some elements of abstraction such as floating and sinking, measuring time and measuring weight, while Yoruba language medium was the most effective in the attainment of the primary science concepts that pupils are familiar with, like identifying plants and animals.

Conclusion

Going by the paper, the very recent studies to support bilingualism as the medium of instruction at the primary school level. It becomes important, therefore, that

the language policy as specified in the National Policy on Education (1981) be re-examined with a view to adopting bilingualism (at the lower classes i.e primary one to three) for the learning of primary science at the primary school level. The use of bilingualism for instruction in primary schools will also possibly increase the scope of the child's knowledge. Moreover, many significant concepts today, particularly in science, do not have words representing them in the Nigerian mother tongue. This problem will likely be eliminated by using bilingualism at the basic level. It is also expected to be beneficial to the pupils in the learning of primary science, if teachers become aware that bilingualism could be used as a medium of instruction for teaching those concepts that require various levels of observation at the basic level.

Finally, teachers curriculum planners and government should work toward improving the orthography in science in the Nigerian languages.

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