



## CHALLENGES ENCOUNTERED BY NON-SCIENCE TEACHERS IN TEACHING BASIC SCIENCE AND TECHNOLOGY IN THE NIGERIAN UNIVERSAL BASIC EDUCATION (UBE) CURRICULUM

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### **Abstract**

This study was aimed at finding out the attitude of non-science specialist teachers to teaching of basic science and technology and the difficulties they encounter while teaching the subject. The descriptive survey involved 126 primary six non-science specialist teachers in primary schools in Anambra State, Nigeria. The study was guided by two research questions. A structured 20-item questionnaire developed by the researchers was used to collect data. Data were analyzed using frequencies and mean. Results show that: (1) Non-science specialist teachers teaching basic science and technology have positive attitudes towards the subject. (2) The teachers do not find it difficult to comprehend basic science and technology textbooks, they can operate the equipment and perform simple experiments, they can improvise the equipment and materials they use in teaching and they understand the concepts involved. (3) Inadequate teaching materials, pupils not being able to easily understand science and technology lessons, difficulty in explaining some concepts in mother tongue (Igbo language) and teacher training program being mainly theory-oriented were some of the problems encountered by the non-science specialist teachers in teaching basic science and technology. Based on these results, recommendations were made some of which were that the serving teachers should be provided with regular in-service training through workshops; all pre-service (trainee) teachers should be exposed to the rudiments or introductory aspects of science and technology; and efforts should be made to create Igbo names for the science and technology terminologies and equipment to enable the teachers to effectively communicate science concepts to students.

*Keywords:* Nigeria Science Education, Nigeria Primary Education, Non-science Specialist Teachers, Basic Science and Technology, Universal Basic Education.

### **Introduction**

A major policy innovation in Nigerian National Policy on Education is the introduction of Universal Basic Education (UBE). The UBE was introduced in the country on September 30, 1999 by President Olusegun Obasanjo as an innovation for ensuring access to basic education for every Nigerian child of school age in line with the United Nations declaration on "Education For

All". To achieve this goal, Nigeria's National Council on Education (NCE) approved a new reform in the delivery of primary education in Nigeria in 2004. This reform introduced a 9-year uninterrupted basic education program made up of three years of lower basic education, three years of middle basic education (both located in Primary School) and 3 years of upper basic education (Junior Secondary School level).

The primary level of education is considered all over the world to be the most important level of education being a foundational level. The National Policy on Education put it more succinctly when it stated that "since the rest of the education system is built upon it, the primary level is the key to the success or failure of the whole system" (Federal Republic of Nigeria (FRN), 2004, p. 14). Primary education therefore forms the basis for a child's ability or inability to function well at post-primary levels. This implies that whatever achievement a child will make in his/her future academic endeavor depends on the foundation laid for him/her at the primary level (Osuafor & Okigbo, 2010). Furthermore, in this era of scientific and technological advancement, there is need for a solid foundation in science and technology education at the primary level of education so as to engage them at a young age. Science therefore should be effectively taught at the primary school level to prepare children for further studies in science and technology at a higher level of education.

The some primary objectives of teaching science at the primary level include:

- to lay a sound basis for scientific and reflective thinking;
- to give the child opportunities for developing manipulative skills that will enable the child to function effectively in the society within the limits of the child's capacity; and
- to provide the child with basic tools for further educational advancement, including preparation for trades and crafts for the locality (FRN, 2004, p.14).

These objectives cannot be achieved without a firm foundation of scientific enquiry at the primary school level. Tomorrow's problems can be analyzed and solved more easily if the primary school of today does a better job of preparing the child to face tomorrow's problems through appropriate teaching and learning of science.

In this contemporary age of scientific and technological advancement, the need to keep pace with the global trend of development demands that people should be scientifically literate. Scientific literacy according to Nwagbo (2006) is the use of scientific knowledge acquired by an individual to solve personal and civic problems confronting him in the society. Without scientific literacy among a sizable proportion of the society, progress in achieving modernization will be difficult. Scientific literacy has such a dominant effect on people's lives that it is now considered essential for every citizen to be scientifically literate. While it is not expected that all citizens will become scientists, scientific literacy will help the leaders and policy makers to understand and propose suitable solutions to environmental problems, health problems, and other societal problems. It will also help the populace to understand and support policy decisions.

Basic science and technology is designed for pupils at the lower basic and middle basic levels of primary education. The teaching of this subject therefore requires specialist science teachers capable of originating and maintaining suitable learning conditions in and outside the classroom. The federal government, being fully aware of the importance of specialist teachers at this level, listed the provision of specialist teachers in some subjects including science and mathematics as one of the educational services that will be provided at the primary education level. Some efforts were made in this direction but much still needs to be accomplished.

Most of the teachers handling Basic Science at the primary school level are Arts-oriented as they were not specially trained to teach science subjects at the primary school level. In addition, each teacher is in charge of one class and teaches all the subjects offered by that class irrespective of his/her area of specialization. Ali (2009) in Osuafor and Okigbo (2010) blamed this practice for being responsible for poor pupils' achievement at the primary education level. It

could also be responsible for the Nigerian primary science pupils' poor performance at international competitions as reported by Okebukola (1997). In a study by Osuafor and Okigbo (2010) on the analysis of the performance of pupils taught primary science and mathematics by specialist and non-specialist teachers, it was revealed that pupils taught primary science and mathematics by science and mathematics specialists performed significantly higher in their achievement test than those taught by non-specialist teachers. The non-science specialist teachers presumably find it difficult to adequately impart scientific knowledge to their students. Unfortunately this deficiency is carried forward and is reflected in the performance of the science students at the Junior School Certificate Examinations (JSCE) which is the first end-of-course examination taken at the end of the 9-year Basic Education program. Pupils' level of performance on the JSCE in Anambra State, Nigeria from 2009-2012 is shown in Table 1.

**Table1: JSCE Quality of Performance in Basic Science and Basic Technology (2009-2012)**

Exam Subject	2009			2010			2011			2012		
	% A1-A3	% credit	% pass	% A1-A3	% credit	% pass	% A1-A3	% credit	% pass	% A1-A3	% credit	% pass
Basic Science	1.1	47.6	50.2	0.8	45.1	53.5	2.7	42.0	51.8	0.4	42.7	56.7
Basic Tech.	2.2	41.5	54.2	1.3	44.1	53.7	2.2	32.9	62.6	0.3	45.0	54.4

From the analysis shown in Table 1, it is evident that less than 50% of the candidates that sat for the examination passed at credit level and above within the years under investigation. Basic science and technology is a relatively new introduction into the primary education curriculum especially the technology aspect. Then, how do these non-science teachers themselves perceive their responsibility as science and technology teachers at the primary school level? Do they encounter difficulties in discharging this duty? These issues form the basis for this study. The study therefore aims to identify the difficulties that non-science teachers encounter in teaching Basic Science and Technology from their own perspectives. Consequently, the researchers make recommendations based on their findings to alleviate such problems.

### Research Questions

The following research questions were raised to guide the conduct of the study.

1. What is the attitude of non-science specialist teachers in primary schools to teaching Basic Science and Technology?
2. What difficulties do non-science specialist teachers in primary schools encounter in teaching Basic Science and Technology?

### Method

The descriptive survey design was used in the study to obtain the respondents' views on the items of the instrument. The study was carried out in Anambra State, Nigeria. The population of the study consisted of all the non-science specialist teachers in primary six in all the twenty-one (21) Local Government Education Authorities' (LGEAs) schools. At the time of this study however, the exact population of these non-science specialists could not be obtained from the State Primary Education Board (SPEB) that oversees the affairs of the Universal Basic Education. However, information gathered from their office revealed that most primary schools in Anambra have only one class of primary six except for those in the cities that may have two or three classes. This implies that the total number of non-science specialist teachers in primary six may not be far above the total number of primary schools in the state.

There are 1,040 primary schools in the 21 LGEAs in Anambra and presumably, the population of the non-science specialist teachers will be about the same figure or slightly above. A sample of 126 primary six non-science specialist teachers was used for the study. Simple random sampling technique with replacement was used to select approximately 10% of the total number of schools in each LGEA. All primary six non-science teachers in each of these sampled schools became the sample for the study giving a total of 126 teachers. Each teacher in the sample teaches all the subjects offered by the class assigned to him/her including Basic Science and Technology. Out of this sample, six teachers were found to be science specialists and so their completed questionnaires were discarded and the remaining 120 completed questionnaires were used for data analysis.

A structured questionnaire developed by the researchers was used for data collection. The questionnaire consisted of 20 items divided into three sections A, B, and C. Section A sought information on bio-data of the respondents, while Section B elicited information on attitudes of non-science specialist teachers towards the teaching of Basic Science and Technology. Section C sought information on difficulties encountered by non-science specialist teachers in teaching Basic Science and Technology. Responses were sought on a 4-point scale of “Strongly Agree (SA)”, “Agree (A)”, “Disagree (D)”, and “Strongly Disagree (SD)”. These were assigned scores of 4, 3, 2, and 1 respectively. For section B, a score of 2.5 and above shows a positive attitude toward teaching, while scores below 2.5 indicate a negative attitude teaching Basic Science and Technology. Similarly for section C, a score of 2.5 and above indicate difficulty in teaching, while scores below 2.5 indicate no difficulty in teaching Basic Science and Technology content. One hundred and twenty six (126) copies of the questionnaire were administered to the respondents. Questionnaires were completed by the respondents and returned to the researchers on the spot to avoid any loss.

**Data Analysis**

Six copies of the questionnaire were discovered to have been filled by science specialist teachers in the sampled schools. These were discarded. Data from the remaining 120 copies were analyzed using frequencies and mean analysis.

**Results**

The results for research question 1. What is the attitude of non-specialist science teachers towards the teaching of basic science and technology? are delineated in Table 2.

**Table 2: Attitude Non-Science Specialist Teachers towards Teaching Basic Science and Technology**

S/NO		SA	A	D	SD	Mean	Remarks
1.	I find teaching of Basic Science and technology very interesting	30	63	15	12	2.93	Agree
2.	Basic science and technology should not be taught at primary school level	12	–	33	75	1.58	Disagree
3.	As a non-science specialist, I don’t enjoy teaching Basic Science and technology	15	20	50	35	2.13	Disagree
4.	I hate carrying out experiments	15	20	45	40	2.08	Disagree
5.	Primary school pupils are too young to do science	12	–	33	75	1.58	Disagree
6.	Non-Science specialists should be excluded from teaching Basic Science	21	36	42	21	2.48	Disagree
7.	Teaching of Basic Science is difficult and	24	18	60	18	2.4	Disagree

	cumbersome						
8.	Teaching Basic Science as a non-science specialists has imparted positively in my life	54	45	18	3	3.25	Agree
9.	Any professional teacher can teach basic science and technology	30	45	25	20	2.71	Disagree

Table 2 reveals that the non-science specialist teachers teaching Basic Science and Technology have positive attitudes towards the subject. They are interested in the subject and have positive attitudes toward teaching it. The majority of them agree that the subject has a positive impact on their lives.

The results for Research Question 2: What difficulties do non-science specialist teachers encounter in teaching Basic Science and technology? are demonstrated in Table 3.

**Table 3: Difficulties by Non-science Specialist Teachers Teaching Basic Science and Technology**

S/NO		SA	A	D	SD	Mean	Remarks
1.	Basic Science and technology text books are difficult to comprehend	12	27	57	27	2.25	Disagree
2.	I find it difficult to perform simple experiments in Basic Science and technology	6	51	42	21	2.35	Disagree
3.	I find it difficult to operate the scientific equipment used in teaching Basic Science and technology	12	45	36	27	2.35	Disagree
4.	There are very few text books in Basic Science and technology	36	51	21	12	2.93	Agree
5.	The number of periods given for teaching of Basic Science and technology are inadequate	60	39	12	9	3.25	Agree
6.	Equipment available for use in teaching Basic Science and technology are inadequate	36	51	21	12	2.93	Agree
7.	I do not know how to improvise science and technology equipment	12	27	57	27	2.25	Disagree
8.	Pupils find it difficult to understand science and technology lessons	39	51	24	6	3.03	Agree
9.	Primary science and technology cannot easily be taught using mother tongue for easier understanding	39	51	24	6	3.03	Agree
10.	As a non-science specialist, I find difficult to understand scientific and technological terms and concepts	12	36	45	27	2.28	Disagree
11.	My training program as a teacher trainee was mainly theory-oriented	24	60	27	9	2.83	Agree

The results in Table 3 show that non-science specialist teachers identified several barriers in teaching Basic Science and Technology. Some of the problems non-science specialist teachers encounter included: inadequate material resources; subject not allocated enough time; pupils not

finding the subject easy to learn; difficulty in using mother tongue to explain some difficult concepts; and teachers not being exposed to practical training.

### **Discussion**

Results from this study reveal that non-science specialists teaching Basic Science and Technology in primary schools believe that the subject has a positive impact on their lives. With such positive attitudes, one would expect that these teachers would put in their best when teaching the subject. But their poor science background during their training could be a hindrance. For example, they were not exposed to science practical activities as revealed in Table 3 above. Some scholars (Njelita, 2001; Osuafor & Okigbo, 2010) are of the opinion that the teaching of mathematics and basic science and technology should be left in the hands of specialists only. But the finding from this study showed that the non-specialists are opposed to this idea. Therefore supports should be implemented to help these practicing teachers improve their ability to effectively handle the subject.

This study also revealed that inadequate supply of resources like text books and laboratory equipment constitute a hindrance to their effective delivery of the subject. This is consistent with earlier findings (Ezeliora, 1999; Chukwuneke, 2010) that unavailability of teaching materials hinders effective delivery of Science, Technology and Mathematics in general. However, the non-science specialists indicated that improvisation of these materials is not a problem to them. Still it is common knowledge that not every type of equipment can be improvised from local materials. This study also revealed the inability of the teachers to explain certain terminologies and concepts in Igbo language (the language spoken by the community in the area of study) was a stumbling block to the students' proper understanding of the subject. The Federal Ministry of Education had earlier recommended the use of mother tongue in teaching basic science at lower basic level (Primary 1 to 3). This constitutes some problems to the non-specialist science teachers (and even the specialists) as they may not be able to find appropriate expressions and words to convey the basic science concepts to the pupils. Therefore something this policy and how best to implement it needs review to help the teachers explain the equipment and concepts involved in teaching science and technology on a level that the pupils can understand.

### **Recommendations**

Based on the findings of this study and the discussion above, the researchers made several recommendations. Since it is not currently possible to train and employ enough Science, Technology, and Math (STM) specialists in the teaching field, the serving non-science specialist teachers should be provided with regular in-service training through workshops. By so doing, difficult concepts and how to teach them effectively in the class will be provided to them. Nzewi (2011) emphasized the importance of this training in raising the educational standards when she stated that "if the entire teaching force in Nigeria becomes well trained and positioned, then the Nigerian nation will well be on the March towards realizing its vision 20:2020... of making Nigeria one of the top 20 economies of the world by the year 2020" (p.1). In this regard, efforts of the Science Teachers Association of Nigeria (STAN), Anambra State Branch, Universal Basic Education Board (ASUBEB), and the National Teachers Institute (NTI) are highly commended in advancing this recommendation. Other groups and organizations should also lend their support.

All pre-service (trainee) teachers in Colleges of Education and in the Faculties of Education in Universities should be exposed to the rudiments or introductory aspect of science and technology irrespective of whether they are specializing in science. In addition, for effective delivery of science and technology education, textbooks and other teaching materials needed should be made available in all primary schools. Textbook authors should be encouraged to write

textual materials since Basic Science and Technology is a fairly new subject area in the primary school curriculum.

Another recommendation is to allocate enough time to Basic Science and Technology in the teaching time table. Basic science and technology is a practical-oriented subject and therefore needs more time than the normal 30-35 minutes lesson period to be properly executed. Mkpa (2010) advocated that a lesson period in the primary school of not less than 50 minutes, similar to the United Kingdom, United States, and some other places. This will allow ample time for the class to experiment, explore, undertake group work, and other activities that call for active participation of the pupils in the class.

Finally, specialists in the mother tongue (Igbo language) should work with Science and Technology specialists to create local names for the science and technology equipment, terminologies, and concepts to support science knowledge in the students' first language and thus make it easier for the teachers to communicate ideas clearly to the pupils.

### Conclusion

The study focused on the challenges encountered by non-science specialist teachers in teaching Basic Science and Technology to primary school pupils. Results showed that the non-specialist Basic Science and Technology teachers are favorably disposed to the teaching of the subject. The teachers are opposed to the idea of allowing only the specialist teachers to teach the subject. They strongly believe that teaching the subject does not pose a problem to them as they understand the scientific terms and concepts very well and are able to operate the equipment used in teaching the subject. Their major problem is that textbooks and other facilities are not adequate. Also some science and technology terms and concepts cannot be expressed in the mother tongue (Igbo language) which is the primary medium of communication at this level of education.

These findings will help the government to see the need for professional development of the serving teachers especially as the option of providing enough specialists in science and technology may still take a long time. The study has also highlighted other areas that need the attention of the government and other stakeholders in order to improve the quality of teaching.

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