Teaching Methodology in Basic Science and Technology Classes in South-west Nigeria

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ABSTRACT— ***Teaching and learning of Basic Science and Technology (BST) in place of primary science became operational in Nigeria since 2008. The implementation of the new BST curriculum has been a concern to various stakeholders. The study investigates teaching methodology by assessing proportion of time teachers spent in various classroom activities and some basic lesson features geared towards achievement of the objectives of BST in primary schools across South Western Nigeria. It is a descriptive study. Through stratified and judgemental sampling techniques, twenty schools and sixty primaries 3, 4, and 5 BST teachers from Oyo, Ogun, Osun, Ondo, Ekiti and Lagos States participated in the study. Three research questions were answered. Two observation technique instruments were used to gather data that was analysed using descriptive statistics. Basic science and technology teachers in the South-West region of Nigeria are doing well in the area of preparation of lesson note, making learners ready and subject mastery. In communication, the teachers were just fair; the teachers had to intermittently teach science in Yoruba, the language of the environment, across the classes. Out of 20 minutes an average of 8 minutes (38.8%) were spent on teacher prompting learning and this was followed by monologue, while reward and praise was mainly by clapping of hands. An average of 45% of lesson time was on teacher singular activity while 16.7% of time was on whole class discussion. Teachers need to adopt more students centred teaching strategies and approaches to meet the aims of the new curriculum.***

Keywords— Basic Education, Basic science and Technology, Primary school, Teaching methodology, Classroom activities.

1. INTRODUCTION

Science and technological growth in particularly identifies the status of any nation in the global village. Science is a systematic body of knowledge while technology is practical application of knowledge to achieve results and our value concepts guide us as to what we ought to do with both. Hornby [1] describe science as knowledge of principles and causes, which can be tested to ascertain their truth.

Science came as part of the school's curriculum in Nigeria like any other African countries, through the influence of the colonial masters [2]. Up till early 1960's science was given relatively little attention. Yoloye [3] noted that what was taught in the primary schools then could only passed for Nature study, Hygiene (Health Science), Rural science and Gardening. The objectives were simply for the development of clean and healthy habits; gaining knowledge of nature, specifically plants and animals; and of principles and techniques of farming. This type of science dominated by Nature Education got a boost through the funding provided from foreign government as a result of their strong determination to develop their newly independent Africa states.

There were series of conferences held for the improvement of science teaching in Africa. The Rehoboth conference stood out among such conferences [4]. The conference led to the Elliot conference in 1969 that gave rise to the Africa primary science project (APSP). In Nigeria by the mid 60's the regional government metamorphosed into states. The different states began the development of their primary science programs, while some tertiary institutions also embarked on some projects to fashion out more formidable science programme. In 1978, at the National level the primary school committee of the joint consultative council set up a reference committee which was to come up with a core curriculum for science education at the primary school level. This curriculum was published in 1980, modified in 1984 and revised in 1991. Primary science was included in the curriculum of primary education so as to achieve some specified goals and objectives [5] [6].

All students of science, at whatever level are expected to be exposed to learning that can develop traits of science in them. The development should be such that their knowledge of science and experiences gathered should be geared

towards applying if to solve practical real life problems. The primary school is just the right place to start laying foundation of such development.

Primary education is supposed to be given in an institution for children aged 6-11 + year. This level of education aims among other things to inculcate permanent literacy and numeracy and to lay a solid basis for scientific and reflective thinking [7]. The Universal Basic Education (UBE) in Nigeria was launched as a consequent to the world declaration of Education for All (EFA) in the Jomitten conference of 1999 in which Nigeria was a signatory. The UBE was launched in 1999 as an instrument per excellence in which the laudable goals of EFA was to be achieved by year 2010. Two of the core subjects through which the goals of education could be achieved are Basic Science and Technology and Basic Science which were formerly Primary science and Integrated Science in Primary School and Junior Secondary School respectively since the year 2005. However when the Federal Government of Nigeria declared the 9-year basic education programme, there were series of revision, restructuring and re-alignment of the Basic Science and Technology Curriculum. This was done more especially to meet up with the targets of the context of National Economic Empowerment Development Strategies (NEEDS) and the Millennium Development Goals (MDGs). The new Curriculum became operational in 2008.

The new BST curriculum covers three strands of basic education in Nigeria. The strands are lower basic education (primary 1-3); middle basic education (primary 4-6) and upper basic education (Junior Secondary School 1 – 3). At the Junior Secondary School however, the subject is split into Basic Science and Basic Technology for more in-depth teaching and learning of the rudiments of science and technology respectively. Ihebeveme [8] while proffering solutions to challenges teachers face in their efforts to realising the goals of universal basic education in Nigeria stated the need for a student (pupil) oriented climate. This means that the teachers are expected to make the interest of the pupils to acquire knowledge paramount in their minds and act accordingly. The country's National Teachers' Institute (NTI) [9] makes it clear that the general objective of BST is to enable pupils observes and explore the environment using their senses and their hands. The Institute have the under listed as the reasons why BST programme is an important aspect of the 9-year Universal Basic Education.

- Explain event in nature
- Have all round development (cognitive, affective and psychomotor)
- Think and reason in a logical manner
- Acquire skills that can be scientifically employed in gathering information from the environment to solve science puzzles.
- Develop effective natural curiosity when they carry out scientific investigations

Sharehu [10] in his capacity as a chief executive officer of NTI identified a number of factors that are responsible for the decline in the quality of teaching and learning at the primary school level. The factors are inadequate infrastructure, poor teaching and learning environment, lack of basic teaching materials, non-challant attitude of parents and low quality of teachers. Babatunde [11] also pointed out that the teacher being a curriculum implementer and guide to the learner needs to know what to teach, how to teach it and how to ensure that learning takes place. Professional development of teacher in whatever form, is important for effective lesson delivery [12]

Mbajiorgu [13] noted that children like science, and that it is as the primary school level that wandering and inquiry minds are nurtured. It is therefore the duty of the BST teachers to spark the interest of the pupils at this foundation level to make them like science such that they can eventually choose science related professionals when they grow old. According to Babatunde [14], the skills and knowledge teachers take to the classroom determines to a large extent what takes place in the class. The new BST curriculum has been in operation since 2008 and teachers have been mobilised for its effective and total implementation across the country. However, some problems have been identified to be hindrances to this desired goal. Some of the problems as earlier envisaged by NTI [9] include:

- Inadequate supply of curriculum module
- Inability of the basic science teacher to meaningfully interpret the performance objective.
- Skipping unfamiliar concept or area
- Inability to organise activities for pupils
- Skipping activities where materials are not ready available
- Inability to identify sources of teaching aid
- Lack of assessment skills
- Brushing the pupils to complete the scheme of work

The inability to achieve the goals of BST curriculum at the primary school may be dependent on how teachers manage the resources at their disposal. There have been studies on teacher factors in relation to pupils' achievement and

on different teaching methodologies. However, there is still not much empirical explanation on lesson delivery and how BST teachers manage time for different class activities.

1.1 The Problem

This study was set to investigate the Basic Science Technology (BST) teachers' teaching methodology across the south-west zone of Nigeria. It was carried out with a view to finding out how the classroom practices are contributing to the achievement of the laudable aims of the subject especially in its new form in the school curriculum and proffer ways of improving upon what we have on ground. This study therefore investigated the proportion of time teachers spent in various activities that can lead to effective teaching and learning in the classroom. It also assessed the teachers on some basic lesson features so as to establish how they are working towards the achievement of the objective of the BST stated in the revised curriculum.

1.2 Study questions

The following study questions were addressed in the study.

1. What is the assessment of the Basic Science and Technology teachers teaching effectiveness with respect to the under listed lesson features:
   - (i) Teacher preparation
   - (ii) Making learners ready
   - (iii) Progression
   - (iv) Communication
   - (v) Teacher-pupils interaction
   - (vi) Praise/reward
   - (vii) Use of instructional material
   - (viii) Exhibition of subject mastery

2. What is the pattern of classroom interaction in Basic Science and Technology with respect to the following categories of behaviour?
   - (i) Individual student work
   - (ii) Student group activity
   - (iii) Teacher prompting learning
   - (iv) Monologue (Talking non-stop by teacher)
   - (v) Teacher not facilitating learning
   - (vi) Confusion
   - (vii) Others (that cannot be categorize into any of the behaviours listed above)

3. What proportion of the teaching-learning time is spent on the under listed classroom activities in the primary science class?
   - (i) Teacher lecture
   - (ii) Guiding
   - (iii) Group or individual activity
   - (iv) Whole class discussion
   - (v) Transition

2. METHODOLOGY

The study is a descriptive study. The sampling procedure adopted was multi-stage. Each of the state in the south-west region of Nigeria forms a stratum. The states are Oyo, Ogun, Osun, Ondo, Ekiti and Lagos. Through Judgemental Sampling Procedure, three local government areas, such that one was of a rural setting, were selected from each state. The schools from the selected local government areas were stratified into private and public schools. By random sampling, one private and two public school(s) respectively were selected from each of the state. In Oyo state, however, five schools were selected, two private and three public. This is because Ibadan (capital of Oyo state) is the historic capital of the South-West zone (then as region) before the six states were created out of the region at one time or another. The city of Ibadan still serves as representative centre of the geo-political zone. Also the number of schools in Oyo state surpasses any of the other states. In all, twenty primary schools, seven private and thirteen public took part. In each of the sampled schools, three (3) teachers, teaching Basic Science and Technology in primaries 3, 4 and 5 were selected. This gives a total of sixty (60) teachers. In some of the participating schools there are teachers who teach same subject across a number of arms, such teachers were observed in the different classes. Three research assistants were engaged for the

study, to administer the instruments respectively in Ondo, Ekiti and Lagos state. Their competence at using the study instruments were however ascertained before the data collection exercises.

Three observation schedules were used as instruments to gather data on the various methods and strategies adopted by primary school teachers while teaching BST. They are Basic science and Technology Teaching Effectiveness Scales (BSTTM) 01): Classroom interaction sheet (CIS) as BSTTM 02; and Assessment of Teaching Methodology Basic Science and Technology (BSTTM 03)

(i) *BSTTM 01: Basic Science and Technology Teaching Effectiveness Scale:* This is a rating scale on which some features of classroom interaction are to be rated. The higher the score a teacher receives from this scale, the more effective the teacher is in the use of instructional strategies necessary for learning to take place. The inter-rater reliability of the instrument was established with three primary schools– one private and two public schools in Ibadan North Local Government area. This gave a value of 0.84. A concurrent validity of the instrument was established using similar instrument for teaching practice along with the instrument on the same set of subjects. A value of 0.93 was derived.

(ii) *Classroom interaction sheet (CIS):* an instrument usually used by the Institute of Education, University of Ibadan to assess classroom interactions was adopted as BSTTM 02;

(iii) *BSTTM 03: Assessment of Teaching Methodology in Basic Science and Technology:* This has a variety of classroom activities, which are to be coded at every 20 seconds whenever such activity occurs in the classroom. An estimate reliability of 0.80 was established for BSTTM 03.

The researcher and the three research assistants visited the selected schools to identify and intimate the BST teachers that would be involved in the study. The teachers' co-operation was solicited since they would be observed while teaching at least twice. The teachers were enjoined to teach as naturally as possible.

The first lesson of the teachers was rated with BSTTM 01 for a period of 30 minutes. Where possible the BSTTM 03 was coded for another 10 minutes. Some teachers have prolonged Teaching of Basic Science and Technology for as long as one hour or more. For each of the observation the first five minutes of the first day was not rated nor coded so as to allow for the stability of the classroom climate, the teacher and the rater. In another lesson, the twenty-minute classroom interaction sheet (BSTTM 02) was coded. The BSTTM 03 was also coded for another 10 minutes or 20 minutes where possible. In all a single teacher was observed while teaching Basic science and Technology for two or three periods; this is to allow time to rate with BSTTM 01, BSTTM 02 and BSTTM 03. The data collection lasted for eight weeks across the six states.

The data gathered were analysed using frequency counts, means, percentages, and standard deviation.

3. RESULTS

Question 1: *What is the assessment of the Basic and Technology teachers teaching effectiveness with respect to the under listed lesson features*

I. *Teacher preparation*
II. *Making learners ready*
III. *Progression*
IV. *Communication*
V. *Teacher-pupil interaction*
VI. *Praise/reward*
VII. *Use of instructional materials*
VIII. *Exhibition of subject mastery*

Table 1 shows the average distribution of time in BST lessons across primaries 4, 5 and 6 for various lesson features.

Table 1: Average Assessment of Basic Science and Technology Teachers in Different Lesson Feature [Maximum score obtainable was ten (10)]

	LESSON FEATURE	SCORE	STANDARD DEVIATION
1	Preparation (getting the lesson note well written before lesson)	7.5	15.3
2	Making learners ready	7	12.1
3	Progression	6	3.68
4	Communication	6	4.88
5	Teaching-pupil interaction	5	3.27
6	Praise, reward	4	2.45
7	Instructional Materials	3	2.22
8	Subject mastery	7	2.18

Question 2: *What is the pattern of classroom interaction in Basic Science and Technology classes with respect to the following categories of behaviour?*

I. Individual student work
II. Student group activity
III. Teachers prompting learning
IV. Monologue (talking non-stop by teacher)
V. Teacher not facilitating learning
VI. Confusion
VII. Others (that cannot be categorised into any way of the behaviours listed above)

Table 2 shows the average distribution of proportion of time in BST classes across primaries 4, 5 and 6 with respect to different categories of behaviour

Table 2: Proportion of Time Spent on Categories of Behaviour during a Twenty-Minute Basic Science and Technology Classroom Interaction.

Behaviour Category	***Average No. Of Tallies (N = 80)**	**Percentage of Time Spent**
Individual student work (A)	15.59 (4)	19.5
Student group activity (B)	9.08 (2)	11.4
Teachers prompting learning (C)	31.07 (8)	38.8
Monologue (D)	12.88 (3)	16.1
Teacher Not facilitation learner (E)	8.24 (2)	10.3
Confusion (F)	2.37 (1)	3.0
Others (G)	0.76 (0)	1.0

*Figures in bracket indicate the approximate number of minutes spent out of twenty minutes

Question 3: *What proportion of the teaching-learning time is spent on the under listed classroom activities in the Basic science and technology class*

I. Teacher Lecture
II. Guiding
III. Group or individual activities
IV. While class discussion
V. *Tr*ansition.

Table 3 shows the average distribution of proportion of time spent on basic teaching –learning activities across primaries 4, 5 and 6.

Table 3: Proportion of Time Spent on Teaching-Learning Activities.

Teaching – learning Activities	Average No Tallies N=90	Summary Total	Percentage of time
A. Teaching/Lecture			
(i) Lecture/Explain	26 (9)		28.9
(ii) Lecture with material	4(1)		4.4
(iii) Give direction on how to operate particular materials	3 (1)		3.3
			8.9
(iv) Ask rhetoric questions	8 (3)	41 (14)	46.7
B. Guiding			
(i) Teacher allows pupils to manipulate materials	5 (2)		5.6
(ii) Teacher reading pupils to discover relationships	2 (1)	7 (3)	2.8
			7.8
C. Group or individual Activities			
i. A particular pupil or group of pupil(s) describe an activity or materials to the class.	4 (1)		4.4
ii. Group/individual carry out observation on material(s)	2 (1)		2.2
iii. Pupils work in small group	4 (1)		4.4
iv. Pupils work in group as a whole	7 (2)	17 (5)	7.8
D. Whole Class Discussion			
i. Teacher initiates discussion on local common concept or phenomenon.	7 (2)		7.8
ii. Pupil/pupils initiate discussion on a local common concept or phenomenon	3 (1)		3.3
			5.6
iii. Extend response to a question	5 (2)	15 (5)	16.7
E. Transition			
i. Moving around to observe something	4 (1)		4.4
	0		0
ii. Moving around to exchange materials	3 (1)	7 2)	3.3
			7.8
iii. Moving around to meet the teacher or clarify something from the teacher			
F. Others			
E.g. Teacher having visitor.	3 (1)	3 (1)	3.3
Students coming to join the class while lesson are on.			

The figure in bracket represents the average number of minutes spent in activity out of 30 minutes.

4. DISCUSSION

In the area of preparation of lesson note, making learners ready and subject mastery, the Basic science and technology teachers in the South-West region of Nigeria were doing well (See Table 1). In communication, the teachers are fairly good they score an average of 6 out of 10, but it was however observed that the teachers had to intermittently speak in Yoruba, the language of the environment virtually in all the three categories of classes observed (Primaries 3, 4 & 5). As stated in page 16, session 4, paragraph 19 e and g, of the National Policy [7], the medium of instruction in the primary schools shall be the language of the environment for the first three years with English being one of the subjects to be taught in schools. As students get to primary four, English progressively become the medium of instruction. This is not fully so, even in primary five, students need to be instructed in Yoruba before they could understand the teacher.

Praise/reward were given to students fairly on the average in the classes, 4 out of every 10 BST teachers were doing this well. The BST teachers were not so good at praising or encouraging pupils' actions or behaviour in the classes. In most of the cases where the pupils' actions were rewarded; it was through clapping of hands by other members of the class. To this investigator, this is rather childish; this should be for the nursery and lower primary classes. Pupil-teacher interaction was just on the average; this has to do with teacher asking questions, while students are responding. Students

learn better when they are carefully involved in the teaching/learning process rather than being passive receivers of informative in the classroom. It is however noteworthy that most of the questions asked were neither probing nor leading questions, they hardly challenge the students' reasoning faculty and they were most of the time rhetoric questions. Teachers seem to forget that part of the objective of BST is to make learners think and reason in a logical manner. The use of instructional material was not encouraging in most of the BST classes observed.

As we can see in Table 2, twenty minutes classroom interaction in the Basic science and Technology science classes, an average of eight minutes (38.8% of the time) was spent in teacher prompting learning, though as stated above, a good proportion of this period was spent on asking rhetoric recall questions. Individual student work took four minutes (19.5% of time) this was followed by monologue (teacher talking non-stop), then teacher not facilitation learning, this was more on teacher commenting on irrelevant matter in the class or receiving visitors or sending students on errands. Student group activities work took only two minutes on the average out of a twenty-minute of classroom interaction. Yoloye [15] had pointed out that the foundation of science is curiosity, which is a passion to have an understanding of the world. Inquiry is the major way to satisfy curiosity. Teachers, who capitalise on this natural tendency of children, usually achieve considerable success in teaching children. As a contributory variable within the classroom environment, the teacher is expected to take up the role of a facilitator of learning being a part of the school and the society at large [16].

From the answer to research question three, 14 minutes out of 30 minutes of Teaching-learning time was on the teacher. On the average, teacher lecture with and without materials for ten (10) minutes, give direction for one minute and ask rhetoric question for three (3) minutes. Emeke and Odetoyinbo [17] corroborate this while observing integrated science class-room sessions in the Junior Secondary Schools recorded that lecture method dominated (55% of teaching time) the teaching strategies followed by explanation of concepts. Similarly, in a study on Monologue Patterns among primary schools teachers in Nigeria across four subjects' areas, Osokoya and Odinko [18] recorded that Primary Science Teachers spent as much as 26% of teaching-learning time on Monologue (Talking non-stop) in Primary six. The teacher guided the students on how to manipulate and discover relationships for an average time of three minutes out of thirty minutes lesson. Five minutes (7.8% of time) was spent on the average on group or individual activity, while class discussion took an average of 16.7% of the total teaching learning time. Moving round to observe something or clarify certain things had an average of two (2) minutes out of a thirty minutes lesson. Osokoya [19] commented that the Nigeria science classes are usually teacher centred while the students are like spectators. The teacher hardly demonstrates nor experiments a concept, neither does the teacher gives the pupils' opportunity to express themselves or be involved in the teaching-learning process as much as possible. In the present study about 45% of time was on teacher singular activity while 16.7% of the teacher time was on whole class discussion. It had been established by Amosun [20] that small group instruction enhances pupils' performance more than the whole class instruction. It is therefore appropriate to have lesser proportion of time on whole class discussion compared to teacher singular activity with individual student.

The Nationals Policy on Education [7] emphatically stated that the teaching methodology should de-emphasize the memorisation and regurgitation of facts. The teaching methodology should rather encourage practical exploratory and experimental methods. In the BST class, there is the need to stress 'hands on' science activity whereby the teacher only acts as the facilitator while the pupils are the actors or the doer. When planning to teach science the teacher should plan to involve the students in the teaching-learning process so that the pupils are not reduced to mere listeners in class. Above all, an effective BST teacher should be able to encourage young children to develop an interest in practicing science as part of their daily lives.

The primary level should help the child to recognize the importance of asking for, obtaining and testing evidence before drawing conclusion. Science and technological appliances abounds in our homes such that children would need to have enough basic scientific knowledge to be able to cope with current and subsequently demands of the society. We should also realise that some of the children in the primary school may not have the opportunity of going to secondary school, it is the knowledge gained at the level that remains their only formal awareness about science and technology for the rest of their lifetime.

5. CONCLUSION

Generally, the teaching of Basic Science and technology has not being completely weaned from the historical antecedents in which students' participation in verbal interactions and skill demonstrations are completely discouraged. Okunola [21] attributed this to inadequacies of equipment and facilities thus leading to limited opportunities for the teachers to design formative evaluation questions that will make students to be more involved in classroom interactions in BST classes.

Going by the trend of research studies on classroom climate especially in the BST lessons, we can notice some improvement in the BST classes observed, but still the Teacher talk 'syndrome still prevail in our classrooms. The

children are yet to be guided and directed by teachers at the primary school so as to lay a sound basis for scientific and reflective thinking'.

There is need for more in-service training for teachers to equip them better. Zakeriya [22] is of the opinion that the opportunities available for professional development for the teachers of BST at the primary school are limited. Science education programme need to integrate pedagogy and content so that the teachers may not only be prepared with respect to a specific subject content but on teaching strategies, varieties of instructional tools, and classroom management that can make science period a transforming teaching/learning experience.

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