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"Teaching Electricity at Nigerian primary schools: Are there occasions when classroom practices are at dissonance with curriculum policy intentions?"

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ABSTRACT

The present study investigates the extent to which what was taught in the classroom conformed to the state standard. Specifically, the exploratory case study focuses on the discrepancies between the actual classroom practices and the policy intentions during the teaching of Basic Electricity in Nigerian primary schools. To achieve the objective of the study, five teachers were observed for three weeks during the teaching of Basic Electricity, a unit of content prescribed in the mandated science curriculum. Subsequently, these teachers were interviewed to collect information regarding the rationale for their classroom practices. Evidences from the classroom observation and documentary analysis of teachers' lesson notes revealed the following discrepancies: variation with respect to (a) content coverage and sequence of content delivery (b) teachers and pupils' activities (c) teaching approaches (d) learning and instructional materials and (e) assessment techniques. The rationale for the observed discrepancies as depicted by the data analysis include: teachers' shallow understanding of curriculum content, fear of pupils engaging in dangerous experiments at home, abstractions of curriculum policy intentions, lack of professional development, teachers' eagerness to complete the syllabus, influx of learners in primary schools, teachers' financial constraint and lack of learning and instructional materials. Based on these findings, recommendations were made towards narrowing the gap between the actual classroom practices and the curriculum planners' intentions.

Introduction

Scholars in the field education often conceived curriculum as teacher's daily lesson plan, but in the actual sense, it is much more complicated when one considers the flow of contents from the officially prescribed curriculum to learned/attained curriculum. Tracing the flow of contents towards the classroom, three distinct types of curriculum (*intended, enacted and attained*) can be identified (Kurz et al. 2010). First, intended curriculum refers to the formal, state-wide mandated curriculum, containing explicit steps and procedures to follow for proper implementation. Second, enacted curriculum refers to what the observer sees in action as the teacher teaches. In other words, it denotes what actually goes on minute by minute in the classroom. Third, attained curriculum denotes what the learner understands, learns and retains from both the intentional curriculum and unintended lessons embedded in the learning environment. Considering the objective of this study, the enacted curriculum, that is how teachers bring the content to life in their classroom (Pak, Polikoff, Desimone & Garcia, 2020) provided the conceptual framework on which this study is grounded. Selecting basic electricity as the content areas of the study, the paper is interested in exploring how closer is the teaching of basic electricity to the standards as expressed in the curriculum policy intentions. The wider the gap between the policy intentions and the actual classroom practices, the less standardized the teaching of basic electricity to the pupils.

The choice of this topic is based on three reasons: first, teaching science in primary schools is preoccupied with exposing pupils to large amount of information rather than arousing pupils' interest to explore scientific ideas and identify problems; second, pupils are unaware of how electricity is generated at a power plant and transmitted to homes despite the fact that they have been seeing street and traffic lights and using home appliances powered by electricity; third, teaching of electricity is associated with many vocabularies (e.g., battery, switch, load, current, dry cell, circuit, anode, cathode). This makes its teaching challenging for teachers and its learning difficult for the learners at primary school level.

As in other developing countries in Africa, primary school science curriculum is developed by the Nigerian Educational Research and Development Council (NERDC), an agency of Federal Ministry of Education using a top-down approach to curriculum planning. With this centralized curriculum, the Nigerian Government solely determines the national curriculum standards to be achieved by all schools and the content to be taught. Contrary to what is happening in some developed countries, the primary school science curriculum is not accompanied by curriculum guide and this may likely have negative effect on its interpretation and subsequent enactment. With this prevailing situation, the State Universal Basic Education Board (SUBEB) that is expected to ensure that the curriculum policy intentions are well interpreted and properly implemented as intended by the curriculum planners seldomly monitors their implementation. Rather, it assumes that there is strict compliance with the curriculum guidelines. However, recent studies (Birbili & Nlyrorali, 2020) have shown that there exists a gap between the intended curriculum (in formal policy) and the implemented curriculum in (school and classroom) because teachers are merely regarded as practitioners who are expected to implement the plans of others (Borko, 2004; Fullan, 2007). They have forgotten that translating curriculum policy intentions into the actual classroom practices is not fully successful (Voogt,

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Pieters & Handel Zalts, 2016) because of the factors such as teachers' conceptions about teaching, learning and leaners, their professional knowledge, their professional identities and expertise and their curriculum ideologies (Edwards, 2011).

In 2012, the existing 6-year Basic Education Curriculum was reformed leading to the emergency of the 9-year Basic Education Curriculum. This was done in line with the country's aspiration to develop scientifically and technologically. This revised curriculum places new demands on teachers and pupils in terms of their roles during curriculum enactment. Teachers and learners are expected to act as facilitators and knowledge builders respectively. Successful implementation of this curriculum requires basic subject-matter knowledge, competency in using appropriate instructional strategies and assessment techniques, and knowledge of the learners and learning process. There is no doubt that these main factors may have strong influence on actual classroom practices of primary school teachers in which one would expect their actions to be in consonance with the curriculum policy intentions. However, previous studies revealed the existence of disparity between curriculum policy and actual classroom practices.

At present, there are still few empirical evidences about the primary school teachers' level of compliance with the curriculum planners' intentions for the education stakeholders to make valid judgment regarding how standardized the teaching of Basic Electricity in Nigerian primary schools. Taking this into consideration, the authors decided to investigate discrepancies between the curriculum policy intentions and actual classroom practices and to identify reasons for the observed discrepancies during the teaching of electricity. To achieve the study's objectives, the following research questions are formulated:

(1) What actually occurred in the science classrooms during the teaching of basic electricity?
(2) What are the observed discrepancies between teachers' classroom practices and the curriculum policy intentions?
(3) In situations where there are deviations from the curriculum policy intentions regarding the teaching of basic electricity, what factors are responsible for the observed deviations?

Policy intentions to guide the teaching and learning of Basic Electricity in Nigerian Primary Schools

As explained by Brown, Ball, Maguire and Hoskins (2011), policy is complexly encoded in sets of texts and various documents and it is also decoded in complex ways. This implies that policy is open to multiple interpretations due to its complexity. In fact, the best-designed curriculum policy does not guarantee effective implementation. What matters most is how best it is interpreted by the teachers, which subsequently shapes teachers' classroom practices. Realizing this, policy makers should therefore consider teacher learning and interpretation of the policy's messages as an important factor for successful implementation of curriculum policy. These policy intentions serve as fixed standards which primary school teachers should make efforts to conform to during curriculum enactment with regard to the teaching of Basic Electricity.

In the context of this paper, curriculum policy is conceived as the formal decisions made by the Federal Ministry of Education through its agency, Nigerian Educational Research and Development Council

(NERDC) that have a direct or significant effect on the teaching/learning of Basic Science and Technology in Primary Schools in Nigeria. To enhance meaningful learning of Basic Electricity at primary five level in Nigeria, the NERDC formulated curriculum policies regarding the teaching of Basic Science and Technology. The aspirations of the society to develop scientifically and technologically coupled with the pupils' interest and their needs led to the development of the under listed policy intentions. They are created deliberately with intentions to guide the teaching and learning of Basic Science and Technology in Nigerian primary schools. In fact, the Ministry of Education used curriculum policies as pivotal working document to standardize teaching and learning of any school subjects. This working document comprised learning objectives to be pursued, content to be taught, teaching and learning methods to be used, learning and instructional materials to support curriculum enactment and means of assessment and evaluation of learning taking place. As observed by Olorundare (2018), a generic profile of a curriculum specifies the main teaching, learning and assessment techniques and also provides an indication of the learning resources required to support effective delivery of content of instruction. In addition, it includes other information regarding attributes that teachers and learners must possess to enable them use the document effectively.

For effective teaching of Basic Electricity, the following are the required national standards as specified by the NERDC (2012) :

Policy Statement 1(Content)

Teaching of basic electricity at the fifth year of primary school should cover the following contents in the order listed: (a) Types of electricity (static and current), (b) methods of generating electricity, (c) conductors and non-conductors, (d) electrical circuits (e) uses of electricity (p.27)

Policy Statement 2 (Performance Objectives)

Pupils' exposure to the above stated contents should enable them to exhibit the following observable and measurable behaviours: (a) identify types of electricity (b) explain how electricity is produced (generated) and used, (c) explain how electricity travels (conducted) from one point to another, (d) group materials into conductors (metals) and nonconductors (wood, glass, plastic) (e) make a simple electric circuit connection (p.27).

Policy Statement 3 (Teachers' Activities)

Teachers' activities during the teaching of basic electricity should include the following: (a) guiding pupils to produce electricity from: friction, magnets and chemicals, (b) providing a variety of materials and guiding pupils to: produce electricity, group materials into conductors and non-conductors, and make an electric circuit, (c) using electric circuit to demonstrate that it can: light bulbs, make magnets or magnetic field, generate heat (d) guiding pupils to complete an electric circuit (p.27).

Policy Statement 4 (Pupils' Activities)

Pupils should be engaged in the following activities in order to make learning of basic electricity meaningful: (a) Rubbing wool materials firmly on a hard rubber rod or comb, moving the rod close to small pieces of paper or pins, observing and recording what happens (b) Rubbing fur or silk material on a glass rod and moving the rod close to small pieces of paper or pin and noting what happens (c) recording findings and drawing conclusions (d) using a simple dry cell (battery), wires, and a light bulb to make a simple electric circuit (p.27).

Policy Statement 5 (Instructional Approaches)

Considering teachers and learners' activities as stipulated above, a student-centred approach to content delivery is recommended as a vehicle to guide and facilitate students' learning of Basic Electricity. This approach suggested experiments, demonstrations, guided discovery, open-ended investigations, and hands-on, minds on activities and other types of engagement through group work as tools of content delivery (p.27).

Policy Statement 6 (Teaching and Learning Resources)

Teachers should foster pupils' understanding through the use of the following learning and instructional materials to support content delivery: (a) wool, fur or silk (b) hard rubber rod or comb (c) glass rod (d) dry cell (1.5v) (e) bar magnets (f) nails, pieces of paper, ropes, threads (g) light bulbs (h) connecting wires (i) circuit board (j) lamp holders (k) switch key (l) pins (m) bar magnets (n) iron fillings (o) paper clips (p) coins (q) rubber bands (p.27).

Policy Statement 7 (Evaluation Guide)

Teachers should carry out both formative and summative assessments and keep adequate records of pupils' performance in order to monitor their progress using assessment questions which include the following: (a) name types of electricity (b) describe how electricity is generated and conducted from one point to another (c) group materials into conductors and non-conductors (insulators) of electricity (d) use materials provided to complete an electric circuit (p.27).

How teachers interpreted the above stated policy intentions (standards) has a strong influence on the degree of alignment between what the teachers intended to teach in the classroom, what was taught in the classroom, and what was required by the state standard. The higher the degree of alignment between enacted curriculum and the curriculum planners' intentions, the more standardized the teaching of Basic Electricity.

Conceptual Framework: The instructional context

This study is deeply rooted in the framework that depicts teachers' classroom practices which can be best described as instructional context. This forms the conceptual basis of the analysis that was carried out in this study.

As revealed by the previous research, there exists gaps between the official curriculum and the actual classroom practices (Oraifi & Borg, 2009; Sandvoll, 2014; Maguire, Braun, & Ball, 2015). Despite the fact that teachers operate under the most prescriptive 'teacher-proof' curricular, there is still existence of spaces for them to mediate the officially prescribed curriculum (Priestly & Philippou, 2018) thereby creating implementation gap. In this sense, teachers should not be regarded as practitioners who are expected to implement the plans of others but rather they enact, translate, interpret and mediate them (Braun, Maguire & Ball, 2010) through a process of interactive refraction (Supovitz, 2008) filtered via existing professional knowledge, dispositions and beliefs. Based on the actual classroom practices, teachers should be better described as curriculum makers rather than curriculum implementers. In other words, teachers are active designers of the curriculum rather than merely transmitters or implementers of other plans (Borko, 2004; Remillard, 2005). This change in teachers' nomenclature from policy implementers to curriculum makers has earlier been observed through previous work on teachers' personal practical knowledge (Clandinin & Connelly, 1992).

In this regard, classrooms could be better described as 'decision-making space' where the teachers are confronted with a number of possible instructional options from which decisions are to be taken. In view of this, classroom practice can no longer be conceived as a space of implementation where the implementer can either act in contrary to the intentions of the curriculum planners or exhibit submissive acceptance to the curriculum guidelines. In the course of content flow from the official curriculum document to the enacted curriculum, teachers make decisions, which are influenced by a range of factors such as their conceptions about teaching and learning, their knowledge of learners' characteristics, their professional knowledge and their curriculum ideologies (Edward, 2011).

In the preceding discussion, enacted curriculum was identified as one of the forms of curriculum that existed along the teachers' pathway to curriculum enactment. How does the enacted curriculum, regardless of its fit with the curriculum policy intentions become established? The question is a complex and an important one that can best be answered by making reference to the four component elements of instructional context. Figure 1 depicts four important elements that characterize the instructional context for teaching and learning of basic electricity

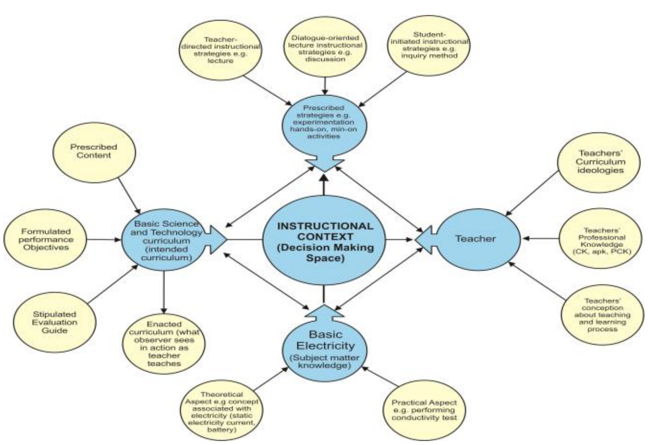

Figure 1: Four important elements that characterize the instructional context for teaching and learning of Basic Electricity

Instructional context was conceptualized by Turner and Meyer (2000) as any feature that characterizes a specific teaching situation. It simply means the "where" of instruction or the context in which teaching and learning will occur. It includes all the factors external to the learners that provide meaning for the messages they receive within an instructional environment. These factors are the officially prescribed curriculum, the subject matter, the instructional strategies and teacher pedagogical characteristics. These are very important because they strongly influence and define what, when, where, how, why, and with whom individual learners learn from instruction..

The instructional context depicted in Figure 1 is based on Turner and Meyer's (2002) conception of instructional context and is central to this framework. Each component element can be described separately as done in the preceding discussion, but it is best understood as dynamically, iteratively and fluidly interacting with and drawing upon the others. The classroom itself is the locus of regular and sustained interactions among students and teachers around the officially prescribed curriculum. The teacher's conception of the term 'curriculum' and his/her interpretation of the curriculum may influence his/her choice of instructional strategy.

Method

A qualitative multiple case study was adopted as an appropriate research design for this study. This is because the authors are interested in understanding how teaching of Basic Electricity happens in science classrooms and why it happens the way it does. As conceived by Yin (2009), a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident, it is appropriate in a situation where one addresses interpretive questions that seek to explore, explain or portray extensive in-depth descriptions of social phenomena (Stake, 1995).

Considering the nature of this study, five primary school teachers (four males and one female) who were assigned by the assistant headmasters to teach pupils at the fifth year of primary school constituted the study's sample. They were recruited from five different primary schools and each school emanated from five different Local Government Areas which constituted an Education Zone. Those schools were rated as the best performing schools by the State Universal Basic Education Board (SUBEB) based on their students' performance in statewide terminal examination known as Basic Education Certificate Examination (BECE). Detailed background information about these participants is shown in Table 1.

Table 1: Background information about the five primary school teachers

Teacher's code	Gender	Qualification	Year of Teaching Experience	Class size
T_1	Male	N.C.E; B.Ed.	12	45
T_2	Female	N.C.E; B.Sc.(Ed.)	15	35
T_3	Male	N.C.E. (PES)	10	53
T_4	Male	Grade II Cert. N.C.E.	25	37
T_5	Male	N.C.E.; B.Ed.	17	42

Teachers' daily lesson plans (i.e. teachers' intended curriculum), classroom observation and interview constituted the three data sources for this study. Teachers' daily lesson plan, commonly described as a concise, working document which outlines the teaching and learning that will be conducted within a single lesson provided information regarding content coverage and teaching sequence. As a document its content should be regarded as "definite findings" because intentions are quite different from realities (Yin, 2003). Realizing this, its content was subjected to further verification by matching its contents with interview and observation data before making reasonable conclusion.

Observational data provided the context for discussion (via interview) with each primary school teacher. These data were based on what observers observed in action as they taught Basic Electricity for duration of three weeks (one double period and one single period per week). All observations occurred during the second term of 2018/2019 academic session. The observations lasted for the duration of the lesson, ranging from 35minutes to 50minutes, with an average lesson time of 45min. To uncover the teaching and learning activities taking place, all observed lessons were videotaped. In addition, observation notes were taken to serve as a backup to videotape. The classroom observation is guided by the lesson observation instrument (a checklist) which focused on: (1) the content covered, depth of content treatment and sequence at which the contents are prescribed to the pupils. (2) instructional strategies employed and teachers' activities exhibited to foster pupils' understanding of the topic. (3) learning and instructional materials used to support pupils learning. (4) learning activities that pupils are engaged in during the teaching of basic electricity. (5) assessment techniques adopted to gauge pupils meaningful understanding of the content taught. As suggested by Borich (2011), the study utilized all the three techniques (checklist, video recording of lessons, observation notes) that are involved in direct observation.

As noted by Bareen, Hird, Milton and Thwaite (2001) it is not possible to infer the intentions of teachers' action or the reason why teachers acted in certain ways during a particular lesson with particular students only from observed practices. Therefore, the conduct of interview becomes necessary. In this study, semi-structured interview technique was employed as another data collected tool to obtain information regarding the rationale behind teachers' classroom practices. Each interview duration ranged from 45minutes to 1hr 30minutes and consisted of two main phases: Pre-classroom observation interview and Post-classroom observation interview. The first phase which is one-on-one interview was conducted with each primary school teacher ahead of the fixed time/period on the school time table for the teaching of basic electricity. Predetermined questions were designed to elicit information on their intended ways of delivering the content to the learners as reflected in their daily lesson plan. Discussion during the interview session was guided by a validated interview protocol. Specifically, the following questions were asked: what do you find to be the key concepts that build up the basic electricity topic that you have prepared to teach your pupils? Are there any reason(s) why you intend to expose your pupils to much learning activities?

The second phase consisted of qualities that were designed to find out whether or not the teachers were aware of their own classroom activities in line with the curriculum planners' intentions, their choice of learning activities, assessment techniques and resources available to support the enactment of the curriculum. Like the first phase, the interview session was directed by the validated interview protocol. The interview was structured so as to allow the interviewer to probe for clarification, justification.

In analyzing the observation, the emphasis was placed on teachers' classroom practices at various phases of the lesson: Introduction, Presentation, Assessment, and Closure. The description of the actual classroom practices as contained in the field notes was compared with the policy intention in order to revealed disparities between the two.

The transcription obtained from the semi-structured interview was analysed using constant comparative method (Strauss & Corbin, 1998). The unit of analysis was the teachers' explanation for observed classroom practices which were at disparity with the policy intention during teaching of basic electricity. The main purpose of employing this method was to develop interpretative understanding of the reasons for the disparity observed between policy intentions and actual classroom practices. Data from teachers' daily lesson plan and classroom observations were used to support the analysis of the interviews. Two main categories namely: contextual factor and cognitive factor emerged through coding and categorizing. Each of the two categories was further subdivided into subcategories.

Data from the classroom observation were analyzed using predetermined coding in which the emerged categories were in line with the components of the curriculum: These categories (Table 8) are: variation with respect to content average and sequence of content delivery, variation with respect to teachers' activities, variation with respect to pupils' activities, variation with respect to teaching approaches, variation with respect to learning and instructional resources and variation with respect to assessment techniques.

Results and Discussion

Actual classroom practices

Part of the curriculum content to be taught is the Basic Electricity which falls under the sub-theme "you and energy". Five primary school teachers were observed in their various classrooms implementing the official prescribed science curriculum. What actually took place in their science classrooms (i.e. enacted curriculum) was reported in accordance with the components of the curriculum as presented in Tables 2 to 7.

Table 2: Teachers' classroom practices with respect to content coverage and sequence of content delivery

Table 2: Teachers' classroom practices with respect to content coverage and sequence of content delivery

	Teachers' classroom practices (observation findings)				
Policy intention	T_1	T_2	T_3	T_4	T_5
Teaching of basic electricity enacted the	T_1 covered the content in the	T_2 covered the content	T_3 covered these contents in	T_4 treated the following	T_5
should cover the following curriculum in the	following sequence:	in the following order:	the following sequence:	topics in the order	listed:
contents in the order listed: order	[M] Basic concepts of electricity	[N] The electronic structure	[A] Types of electricity (static	[E] Uses of electricity	following
[A] Types of electricity (static and treatment:	(change, free and bounded election,	of atom	and current)	[M] Basic concepts of	of
current) Methods of	atom, current, voltage and resistance	[A] Static versus current	[B] Methods of generating	electricity (atom, charge,	[B]
[B] methods of generating electricity generating electricity	[A] Distinguishing between static and	electricity	electricity	electron)	
[C] conductors and non-conductors					
[D] electricity circuits Conductors and	current electricity	[B] Methods of generating	[C] Conductors and non-	[B] Methods of generating	[C]
[E] uses of electricity	[C] Conductors and non-conductors	electricity	conductors	electricity	insulators
Electrical circuits	[D] Electrical circuits	[C] Conductors and non-	[E] Uses of electricity	[N] Atomic structure	[D]
of electricity	[E] Uses of electricity	conductors		[A] Types of electricity	[E] Uses
		[D] Electrical circuits		(static and current electricity)	
		[O] Forms of energy and		[C] Conductors and non-	
		Energy			

Table 3: Policy intentions and realities with respect to teachers' activities during curriculum enactment

	Teachers' Classroom Practices (Observation findings)				
Policy Intention	T_1	T_2	T_3	T_4	T_5
Teachers' activities during the should include the following: (a) guiding pupils to produce electricity from: friction, magnets and chemicals. (b) providing a variety of materials and guiding pupils to: produce electricity, divide materials into conductors and non-conducts, and make an electric circuit. (c) using electric circuit to demo-strate that it can: light bulbs, make magnets or magnetic field, generate heat. (d) guiding pupils to complete an electric. coiled wire of the circuit. using relevant home	Mentioning types of electricity as static and current electricity. No demonstration was done to show the production of electricity from friction, magnets and chemicals. Pupils were not engaged in hands on activities as well. Displaying a chart showing materials being classified into conductors and non-conductors Displaying a chart showing a diagram of simple electric circuit having connecting wires, bulbs and batteries as its components. The display of charts was followed by explanations With the aid of teacher-made chart containing attractive photographs of home devices, T_1 explained various uses of electricity. Rather than teaching the uses one form to another. surrounded with several were used as component board and thereafter, explained each stated energy. Turning a motor	Defining static electricity as electric charge built upon an object. Defining current electricity as a flow electrons going along in wires. Differentiate between the two types of electricity. engaging pupils in learning activities involving making static electricity through using plastic ruler, comb, glass rod. providing pupils with a variety of materials and guiding them to divide materials into conductors and non-conductors through conductivity test. devise to electric circuit. of electricity, T_2 taught how energy can be changed from bulbs and "dead" dry cells chemical energy in dry cells is first changed into electrical energy and then into light requires electrical energy changing to mechanical energy. Similarly, a toaster changes electrical energy thermal energy and light energy.	T_3 organized students into groups to examine the distinguishing between static electricity formed when various objects. Examples of natural occurrences and man-made event of static electricity were given as lightning and TV screen generating it. organizing hands-on activities for pupils to sort out materials into those that can conduct electricity and those that insulate electricity using electrical circuit. T_3 demonstrated the uses of electricity by adding a load/ through lecturing. T_4 further Loads such as a light bulb, a fan, and a core of iron are of electricity on the chalk- electric circuit with a bulb, two dry cells, a switch and connecting wires.	T_4 led the lesson by by engaging pupils static and current electricity by using a brief description of atomic structure as a base to lay the foundation for the present lesson. No demonstration or investigation was carried out in teaching static and current electricity. copying directly from the textbook, the teacher wrote the list of materials that are conductors and non-conductors on the chalk-board. Therefore, pro-viding brief explanation T_4 explained various uses of electricity to the pupils asked pupils to add to the demonstrated how electric current can be used to light flashlight is turned on, the	T_5 introduced the lesson teaching of basic electricity in discussion session through posing of questions such as follows: (1) Have you ever noticed sparking sound when combing your hair with a plastic comb in a dry day? Can you explain what caused the sparking sound? (2) Have you noticed that sometimes two magnets will repel? Stating examples of conductors and non-conductors on the chalkboard and T_5 further list of conductors & insulat T_5 stated the various uses T_2 explained that when guided the pupils to make point appliances for illustrations.

Table 4

Table 4: Policy intentions and realities with respect to pupils' activities during curriculum enactment

	Teachers' classroom practices (Observation Findings)				
Policy Intention	T_1	T_2	T_3	T_4	T_5
Pupils should be engaged in the	Pupils' activities are limited to the	Pupils' activities are limited	examining the static	listening to	teacher's
participating in classroom	following learning activities in	following: listening to teacher's	to the following: listening	electricity formed	when
explanations and instructions	responding to teacher's	order to make learning of Basic	explanation/description of static	to teacher's explanation	various
objects are rubbed. copying the chalkboard	questions.				
electricity meaningful:	and current electricity.	participating in hands-on	observing teacher's	summary	copying
the chalkboard	(a) Rubbing wool material firmly	mentioning examples of conductors	activities to produce	demonstration on how	asking and
responding to	listening to teacher's	on a hard rubber rod or comb andand non-conductors		electricity from friction and	electricity can be used for
teacher's questions	explanation.				
moving the rod close to small pieces	asking and responding to teacher's	chemicals.	various purposes such as		
of paper or pins.	questions.	-grouping materials into	lightening a bulb, rotating		
(b) Rubbing fur or silk material	engaging in note taking	conductors using conductivity	blade of a fan, generating heat		
on a glass rod and moving the rod		test.	from bulb filament and turning		
close to small pieces of paper or		-recording findings	iron core into magnet. engaging in		
pin and noting what happens		drawing conclusion.	hands-on activities to sort materials		
(c) Record findings and drawing			into conductors and non-conductors		
conclusions.			making electric circuit with a bulb,		
(d) Using a simple dry cell			two dry cells, a switch and connecting		
(battery), wires, and a light bulb,			wires.		
making a simple electric circuit.					

Table 5

Table 5: Policy intentions and realities with respect to teaching approaches

	Teachers' classroom practices (Observation Findings)				
Policy Intention	T_1	T_2	T_3	T_4	T_5
A student-centred approach to delivery is	Content delivery is achieved	Content delivery is achieved	Content delivery is achieved	Content delivery is achieved	Content
content delivery is recommended through	through lecture method.	through lecture, investigative	through experiment, hands-	through lecturing, and	achieved
as a vehicle to guide and facilitate discussion and lecture		experimentation, experiment	on activities, teacher's	teacher's	demonstration
students' learning of Basic Electricity. This approach suggested experiments, demonstrations, guided discovery, open-ended investigations, hands-on activities and other types of engagement through group work as tools of content delivery.		and guided discovery	demonstration, and guided discovery.		method

Table 6

Table 6: Policy intentions and realities with respect to learning and instructional materials used to support teaching

	Teachers' classroom practices (Observation Findings)				
Policy Intention	T_1	T_2	T_3	T_4	T
Prescribed Learning and Instructional with limited Materials (LIMs) resources LIMs limited to the following LIMs for teaching static electricity: materials": (1) Wool, fur or silk spoon, fork, razor (2) Hard rubber rod or comb metal bottle covers (3) Glass rod broom stick, chalk (4) Nails, pieces of paper, ropes, locally made pins. threads (5) Bar magnets LIMs for teaching current electricity, conductors and non-conductors, uses of electricity (1) Dry cells (1.5v) (2) Light bulbs (3) Connecting wires (4) Lamp holders (5) Circuit board (6) Switch key (7) Pins, iron fillings, paper clips, coins rubber bands.	T_1 supported the teaching of basic electricity with the following: (1) improvised table torch (locally made) (2) teacher-made chart illustrating electrical circuit (3) teacher-made chart showing the uses of electricity. (4) nail, spoon, fork, blade, locally made pins, plastic bottle covers, coins, chalk, and broom stick.	T_2 supported her teaching with the objects within the classroom such as wool, glass rod, water bottles, cutlass, plastic/wooden rulers, erasers, pencils lockers' keys, chalks. In addition, improvised circuit board was brought to the classroom	T_3 supported the teaching of basic electricity with the LIMs recommended in the curriculum. However, they were borrowed from two neighbouring schools in the town.	T_4 enhanced his teaching with the following learning resources: (1) locally made lamp ("ina Shagari") (2) Group of items such as fork, spoon, biscuit, wrappers, bottle corks, nail, empty tins and scissors. (3) Improvised circuit board constructed from soft woode board, nails, and connecting wires (4) bulds and discharged (dead) dry cells.	T l a n b c a

Table 7: Policy intentions and realities with respect to assessment

	Teachers' classroom practices (Observation Findings)				
Policy Intention	T_1	T_2	T_3	T_4	T_5
Teachers should carry out both formative and summative assess-ments and keep adequate records of pupils' performance in order to monitor their progress using assess-ment questions, which include the following: (a) name types of electricity (b) describe how electricity is generated and conducted from one point to another (c) group materials into conductors and non-conductors (insulators) of electricity (d) use materials provided to complete an electric circuit.	To clarify gaps in pupils' understanding as lesson progresses, both oral and written questions were used. pupils were not engaged in any form of in-class assignments and home-work assignments. No small group assessment. Assessment questions partially reflected representative sample of content taught.	T_2 checked for pupils understanding using short essay questions which are in form of lower-order questions. Questions were asked orally to cover the contents taught. Pupils were not assigned to do any homework at the completion of each lesson	T_3 assessed his/her pupils during learning to see how much they have leant using short answer test items and true/false questions. Pupils were not engaged in any form of in-class assignments. No small groups assessment Thought provoking were not used	To determine how much learning has taken place both multiple choice and short answer test items were used. Quizes were used during presentation to identify problems that might affect content mastery. No small group assessment despite group activities. Oral questions were used to assess knowledge pupils possessed before the commencement of the lesson.	Pupils were evaluated at the start of the lesson to determine their readiness for lesson during discussion. Short answer test items were used to monitor pupils' learning as lesson progresses. Attainment of lesson objective was checked through the use of past Common Entrance Examination questions.

Table 8: Discrepancies between policy intentions and classroom practices

Discrepancy Type	Observed Discrepancy	Reasons for the observed discrepancy
Variation with respect to content coverage and sequence of content delivery	- Inclusion of topics outside what is specified: Basic concepts in electricity, (T_1, T_4) electronic structure of action, (T_1, T_4), forms of energy and energy transformations (T_2) - Reordering of contents during presentation (T_4) - Omission of content (T_3)	*"explaining vocabularies linked with the learning of electricity will serve as prior knowledge for pupils to build their understanding"* *"I taught concept of atoms in a simplified way because it links static electricity". Better understanding of atomic structure will aid pupils' understanding".* *"I think teaching should start from known to unknown, so starting with the uses of electricity is a way to arouse and sustain pupils' interest because they are familiar with home appliances powered by electricity".* *"I deliberately left out this topic untreated. I received no formal training in teaching science. I have a little knowledge about the topic. In this wise, it is better not to teach wrong things to the pupils".* *"the textbook which I am using to teach included energy transformation. This is why I taught my students".*
Variation with respect to learning and what is recommended	- limited learning resources provided. Not adequately covered - teacher-made chart on electrical circuit instead of constructing electrical circuit using bulb, key, battery and connecting wire - substituting discharged (dead) dry cells for functioning dry cells.	*"the little teaching aids you saw during the lesson was as a* Instructional materials used to support teaching *result of my personal effort. No resource centre or primary science lab in school where you can get learning resources for them".*
variation with respect to teachers' activity	- rather than acting as facilitators (posing, thought, questions providing hints and directions, guiding pupils during investigations), they acted as transmitters of knowledge. T_3 is the only exception in this regard.	*"I cannot even interpret the precise role I am expected to play with respect to the teaching of this topic". So, I started with discussion and taught the remaining topics using lecture method". I was not trained to teach science. Information from the text assisted me up to this level"* *"Although, the circuit may not be working because of the dead dry cells, after all it is still better than nothing. No teaching aids and it is a crime to instruct pupils to bring materials from 'home, and I am not financially buoyant because of unpaid salaries so it resulted in offering explanation".*
Variations with respect to pupils' activity	- rather than conducting experiments and investigations, performing demonstrations and engaging pupils in other hands-on activities, their activities are limited to mere listening, observing, note taking. However, pupils taught by T_3 were engaged in some hands-on activities.	*"learning resources for performing investigation and conducting experiments cannot go round. What I have to do is to demonstrate to them due to the large class size. Even grouping pupils, inadequate resources may not allow it to work".* *"these pupils you saw in my class are very inquisitive. If you give them a mile, they will go extra miles. If you allow them in using simple electric circuit to light a bulb, they will try it with AC current secretly at home. This is very dangerous. It is better to explain with a chart that exposes them to hazard".*
Variations with respect to teachers' teaching	The officially prescribed primary school science curriculum recommended experimentation, demonstrations, guided discovery, open-ended investigations as teaching approaches. Contrary to this recommendation, teachers enacted the curriculum using lecture predominately, demonstration and discussion were also employed to deliver science content. To some extent T_3 and T_2 comply with the recommendation.	*"I have to resort to using lecture method just to cover the syllabus. Unexpected school activities and NUT embarking on strike action may surface and interrupt teaching activities".* *"they are just recommending hands-on activities, experiments and investigations. Do these primary schools have science lab for children? Is there any equipment to work with in this condition? Lecturing method is the only available option".*
Variations with respect to assessment techniques	The official curriculum recommended experimentation investigation and group activities as teaching approaches. These approaches suggested small group assessment activities which were not utilized by teachers. No provision for both corrective activities and enrichment activities by the teachers. Although, it is not spelt out in the mandate curriculum, experienced teachers should have known that providing immediate feedback is important in teaching/learning process.	*"enough guidelines pertaining to assessment have not been given; where given it is still not clear to me how to evaluate my pupils on activities involving practical" So we need training.* *"as lack of learning and teaching resources dictates my teaching method, lecture: so it affects the assessment tech-niques. Tell me, how can a teacher conduct hands- on activities assessment without lab equipment and materials? No way!"* "although, we lack learning facilities, pupils' population is a big challenge to me. Materials and equipment to work with cannot go round if all these facilities are available"

Discrepancies between policy intentions and actual classroom practices

To obtain information about the discrepancies between policy intention and actual classroom practices, two steps were involved. First, what is laid down in the officially prescribed science curriculum with respect to the teaching and learning of Basic Electricity was identified. Second, what actually took place during the implementation in classroom is determined. Therefore, the extent to which each teacher acted in dissonance or consonance with the curriculum policy intention is determined. The report of various discrepancies is presented as follows:

As revealed through the classroom observation, three discrepancies were noticed: inclusion and omission of topics, modification of topic and alteration of sequence of content delivery. As shown in Table 2, basic concepts of electricity, the electronic structure of atom, energy transformation and circuit diagram were the topics taught outside the officially prescribed science curriculum. With regard to topic omission, it was only T_5 that failed to teach static and current electricity during the enactment of the curriculum. Modification of topic noticed during the classroom observation was that *uses of electricity* were taught as *different types of energy that electrical energy can change into*. And in doing so, different types of energy transformation were taught as well by T_2. As evidently revealed in Table 1, the sequence of content delivery was highly distorted to the extent that there emerged five types of content sequencing: T_1 (M, A, C, D, E), T_2 (N, A, B, C, D, O), T_3 (A, B, C, E), T_4 (E, M, B, N, A, C), T_5 (B, C, D, E). Classroom observation T_4, revealed that the use of electricity was taught ahead of method of generating electricity and type of electricity in contrary to the sequence prescribed by the curriculum planners (A, B, C, D, E). As noted by Sibanda and Hobden (2016), teachers should search for optimal order for sequencing sub-topics within the main topic in order to maximize students' learning. Similarly, providing pupils with an ordered subject matter in form of an outline before being presented proved to be helpful to them in learning new information (Yoblinski, 2003; Dringoli et al. 2021)

As shown in Table 3, most teachers acted in contrary to what is prescribed as teachers' activities in the official basic science curriculum with the exception of T_2. The policy intention implies that teachers should act as facilitators (guidance providers, prompters, hint givers, question askers, clarifiers) rather than transmitters of knowledge. Teachers acting as facilitators are in consonance with the constructivist approach to learning in which they are expected to guide children's cognitive processing as they actively interact with the social and physical environments rather than direct instruction (Mooney, 2013). The roles played by the teachers during the teaching activities were determined by the instructional strategies adopted. With the exception of T_2, most teachers adopted lecture method as against hands-on group activities and experimental investigations. With the adoption of lecture method (teacher-led instructional strategy), choice for student-initiated activities was limited and instruction was geared towards rote learning. On the contrary, in a science classroom that uses student-initiated learning such as hands-on group activities and experimental investigations, active student participations are encouraged and teachers' domination over most curricular and instructional decisions will be reduced. In such situations pupils' activities will not be limited to passive receptors of scientific information as against what the authors observed during the teaching of basic

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electricity where pupils were rarely expected to ask questions or challenge the information being presented. Pupils' activities are limited to copying note from chalkboard, listening to teachers' explanation or instruction and memorizing information for later recognition or reproduction.

Another variation between the policy intention and classroom practices which was observed during the teaching of basic electricity was concerned with assessment techniques employed by the teachers. The teachers focused on the checking for pupils understanding as lesson progresses and assessing the quality of the learning on the completion of lesson using different assessment tools (Table 7). However, the policy intention expected teachers to do more than this considering the nature of content taught involving hands-on, minds-on activities. These activities are conceived as any science laboratory activity which permits the pupils to handle, observe and manipulate a scientific process. None of the classroom activities observed reflected assessment of science process skills possessed by the pupils since they were not engaged in any group activities or experimental investigations. The only teacher (T_3) that engaged pupils in group activities did not conduct any group activities assessments. Researchers have pointed out that children's interactions with the social and physical environments result in children constructing their own understanding of the world around them (Mooney, 2013; Valksalla & Hodshire).

In addition to the earlier reported variations, is the variation with respect to learning and instructional materials used. It was observed that a poster showing simple electrical circuit was used by T_1 in teaching electrical circuit and uses of electricity. Others neither used poster nor provided their pupils with electrical circuit components for them to use in constructing electrical circuit. Thus, the teachers' role is limited to offering explanation or describing the diagram of electrical circuit. Furthermore, observation of T_4 revealed that a non-functioning electrical circuit was used to teach uses of electricity. It was non-functioning because 'dead' (discharged) dry cells were used in constructing electrical circuit, hence no current flows through the circuit. As noted by Lashley (2019), on many occasions when substitute instructional materials are used they did not stimulate a reasonable proportion of learners and later become uninterested in content being delivered. All these classroom practices were at dissonance with the officially prescribed curriculum. Harwood (2017) also noted that the standards of instructional materials in the classroom for curriculum delivery directly impact the quality of the learning experience.

Teachers' justification for the observed discrepancies

Contextual Factors

Influx of pupils in primary schools: Nowadays, nearly all primary schools experienced rise in learners' population due to the scrapping of school fees. The directive given to all schools not to charge Parents Teachers Association (PTA) fees or any other fees by the government was also a contributing factor to the influx of learners thereby making learning resources inadequate. To prevent the challenges of handling large classes in the face of inadequate learning resources they resorted to the use of lecture method instead of experimental investigation and hands-on, minds-on activities.

Lack of science laboratory and learning resources: There is no provision for science laboratory in the primary schools where practical activities can be conducted. In addition, learning and instruction materials are not available and where they are available they are inadequate. In such a situation, it will be difficult for primary school teachers to implement primary science curriculum as prescribed by the curriculum planners.

Fear of pupils engaging in dangerous experiments at home: As recommended in the official primary science curriculum, pupils are to be engaged in hands on, minds on activities in the construction of electrical circuit and utilizing it to explore uses of electricity. Contrary to this, some teachers used demonstration and lecture method to teach this content with a view to preventing pupils from carrying out these activities at home unsupervised. The teachers ought to have complied with the curriculum guideline despite the danger envisaged. While complying, pupils should be strictly warned to desist from doing any experiment which involves the use of electricity from plug or socket at home. The teachers should further explain to them that it is very dangerous using electricity from such source. Therefore, the use of batteries for electrical experiment is the appropriate practice. Under no condition should pupils use substitute materials or equipment without the teachers' approval.

Teachers' eagerness to complete the syllabus : The fear that teachers' union (NUT) can embark on strike action which may negatively affect scheduled academic activities accounted for a teacher's use of lecture method for quick completion of content. It is understandable that lecture method is not time consuming compared to student-centered approach to content delivery. A teacher in this study considered lecture method as against experimentations, appropriate for content delivery is a situation where strike action is looming. As claimed by T_2, lecture method will allow more contents to be covered.

Teachers' financial constraint. Lack of funds on the part of the teachers is recognized as one of the key factors responsible for teachers' inability to use teaching and learning resources prescribed for the enactment of the curriculum. For instance, for the construction of electrical circuit to teach uses of electricity and to conduct conductivity test, there is need to make the following components of electrical circuit (battery or 2 dry cells, light bulb switch connecting wire and a circuit board) available. A teacher claimed he would not have used 'dead' (already discharged) dry cells but there were no funds to purchase the item. It is this same factor that is responsible for the utilization of objects and materials within the learning environment by teacher (T_3).

Lack of professional development. Professional development is considered as a relevant factor for successful enactment of curriculum especially if teachers are to enact imposed top-down curriculum as experienced by the Nigerian primary school teachers. The interviewees' responses revealed that they needed professional development programme to assist them in the implementation of primary school Basic Science Curriculum. Similarly, Dolfing, Prints, Bulte, Pilot & Vermunt (2021) posited that professional development in form of teachers working together (under a teacher leader) in collaborative settings is an appropriate strategy to support teachers in implementing reformed curriculum. So, lack of effective teacher learning is one of the key factors responsible for the disparity observed between policy intention and actual classroom practices.

Cognitive Factors

Teachers' shallow understanding of science curriculum content: Majority of the teachers employed to teach in Nigerian primary schools are holders of Nigeria Certificate in Education (NCE) whose areas of specialization are outside the field of early Childhood and Primary Education Studies. These categories of teachers are trained to teach in secondary schools where they are expected to specialize in only two teaching subjects as against professional primary school teachers who should be able to teach all primary school subjects including Basic Science. Non-specialist teachers might not understand the science content at the depth necessary to effectively teach it. For learning to be successful in the classroom, teachers' possession of adequate subject matter knowledge and understanding of pedagogical processes are required. Acquisition of this knowledge enables them to use their subject matter to organize and teach content knowledge more effectively. Teachers utilize their Pedagogical Content Knowledge (PCK) to respond to students' learning needs and to recognize students who are struggling to learn and change the way the information is presented in order to make it more understandable.

Abstractions of curriculum policy intentions. When one considers curriculum as a plan or prescription for teaching and learning, then effective implementation of the curriculum requires teachers to make accurate interpretation of the curriculum guidelines. As a result of teachers' inability to have a clear picture on how to go about teaching, grouping of objects into conductors and insulators, they ended up using chart/poster when they were supposed to use conductivity test to sort out conductors and insulators. Due to similar factor, some deliberately left some prescribed topics untreated. In a situation in which teachers are struggling to make sense of curriculum, there is bound to be discrepancy between the intention and realities as observed during the teaching of basic electricity by primary school teachers. As observed by Baun et al (2011), the difficulty teachers faced in an attempt to interpret and translate policy intention into classroom practices is due to the fact that policy itself is complexly encoded in sets of texts and various documents and it is also decoded in complex ways. Teacher education programme should be geared towards equipping teachers with knowledge and skills required to de- and re-contextualize curriculum intentions for it to be meaningfully translated into classroom practices.

Teachers' assumption about how pupils learn. Teachers' application of the learning principle which stated that new knowledge is constructed on the basis of what is already understood by the learners was evidently shown during the teaching of Basic Electricity. This brought about reordering of content which was at dissonance with the prescribed sequence of contents.

Rather than starting the teaching of Basic Electricity from the type of electricity (static and current electricity) as prescribed, some started with the structure of atom while others started with the uses of electricity. The explanation for such deviations from the curriculum policy intention was based on the structure of knowledge. Considering this, atomic structure should come before static electricity in the ordering of chemistry topics. Good understanding of the electronic structure of atom will provide a solid foundation for meaningful understanding of static electricity as resultant effect of an imbalance between negative and positive charges in an object.

As noted by Yoblinski (2003) and Dringoli et al. (2021), providing pupils with an outline of subject matter before the material is to be presented is more helpful to them in learning new information.

Similarly, the teacher (T_4) that started with the uses of electricity claimed that starting with the topic which is already familiar to the pupils will easily activate the prior knowledge in order to build connections between what has been learnt and what is to come next. This practice is most likely to enhance students' understanding. This is because students with more prior knowledge may have more working memory capacity available to process their current learning tasks (Mihalca et al., 2011). To promote learning of chemistry concepts, teachers must develop a teaching sequence based on the understanding that when new information is properly linked to already existing conceptual knowledge there is high tendency for meaningful learning to occur (Sibanda & Hobben, 2016).

Conclusion and Recommendations

Analysis of the classroom observations and teachers' lesson plan in this case study reveals the following as the existing discrepancies between policy intentions and actual classroom practices during the enactment of Basic Science Curriculum: variation with respect to (1) content coverage and sequence of content delivery (2) learning and instructional materials (3) teachers and pupils' activities (4) teaching approaches and (5) assessment techniques.
Having revealed the above stated discrepancies to the teachers during the interview, they presented reasons which accounted for the discrepancies which rendered their teaching to be rated between standard required. Their reasons to justify their instructional activities/decisions which were at variance with the curriculum planners' intention are connected to teachers' assumption about how pupils learn, teachers' eagerness to complete the syllabus, teachers' shallow understanding of curriculum content, abstractions of curriculum policy intention, fear of pupils engaging in dangerous experiments at home, lack of professional development, teachers' financial constraint, lack of learning and instructional materials and influx of learners in primary schools.

Now that the study has revealed the discrepancies and the reasons for them, the next line of action is to find ways of proffering solutions to the problem. In the light of this revelation, four recommendations can be made to guide the Nigerian Research and Development Council, Federal Ministry of Education and the State Universal Basic Education Board (SUBEB) in assisting the primary school teachers in enacting the curriculum in accordance with the curriculum policy intention. First, there is need to encourage more teachers' participation in curriculum development because they are the implementers who have direct dealing with the leaners. This recommendation is supported by Polikoff and Koedel (2017) who acknowledged that curriculum developers cannot anticipate all the challenges that will surface once teachers commence using the curriculum with their pupils. Second, an efficient curriculum implementation monitoring team set up by the SUBEB should be more committed to their responsibility in achieving high degree of compliance with the curriculum guidelines. Third, realizing the fact that for any curriculum to succeed it should be implemented in conjunction with the ongoing job-embedded learning for teachers, therefore, professional development programme should be organized for teachers to help them adapt their teaching to the demands of the curriculum. Fourth, similar to professional development programme, there is need for every school to put in place collaborative learning system to assist teachers understand both the curriculum content and the process involved in enhancing students' learning. Five, concerted efforts should be made by the Ministries of Education in each state to build science laboratories in primary schools and adequate science learning resources should be procured for those laboratories.

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