Availablity and Utilization of Instructional Resources for Implementation of the 3-Year Upper Basic Science and Technology Curriculum in North Central Nigeria

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Abstract: The study evaluated the availability and utilization of instructional resources for implementation of the 3-year Upper Basic Science and Technology curriculum in north central Nigeria.A cross-sectional survey research design was used for the study.The population comprised all 10,688 Basic Science and Technology teachers and 2,703,427 students. The sample consists of 288 teachers and 2,160 students randomly selected from 72 government and private secondary schools in the study area. Basic Science and Technology Teachers Qualification Inventory (BSTTQI) and Basic Science and Technology Classroom Observation Schedule (BSTCOS) were used for data collection. The instruments were validated by three experts, two in Science Education and one in Test and Measurement. The reliability coefficient of the instrument was determined using Crombach alpha and the internal consistence of instruments was obtained as 0.92, and 0.82, respectively. The three research questions which guided the study were answered using simple percentage, mean and standard deviation (SD), while the two null hypotheses were tested in the study at 0.05 level of significance. The findings revealed that 60% of the teachers handling the four areas of Basic Science and Technology are not qualified;the extent of availability of instructional resources such as textbooks, posters, charts, laboratories, and ICT facilities in both government and private schools is not significantly different. However, private secondary schools utilize the available instructional resources moderately against government secondary schools that utilize the resources to a less extent. It is recommended that government and other relevant agencies should ensure that more qualify teachers are employ in the four areas of basic Science and Technology for effective implementation of the curriculum. Also, more monitoring strategies should be mounted especially in government schools to ensure that the available instructional resources are utilized to a great extent.Hence the effective implementation of Basic Science and Technology curriculum is a positive indicator for the realization of the Sustainable Development Goals (SDGs) in Nigeria.

Keywords: Availability, Utilization, Instructional Resources, Science, Technology, Curriculum.

INTRODUCTION

The world today is undergoing major transformations. The global transformations are multidimensional, showcasing scientific and technological innovations which influence economic, social, cultural and political development of human communities particularly those of developing societies like Nigeria. Science and Technology in the generic and global context is a strategic vehicle for socio-economic advancement. Blas and Borens' (2016) opine that science and technology complement each other in driving society's progress in every nation.Science and Technology is essential for sustainable development and transformation of all the key sectors of human endeavors. This is because humanity has been in contact with the challenges of sustainable development which requires that, the fundamental issues be addressed at local, regional and global levels (Akpan, 2015). Therefore, laying a solid foundation of scientific knowledge and appropriate technologies in the thinking and understanding of young children at the Upper Basic Education level is central in resolving economic, social and environmental problems that make current development paths unsustainable. Omiko (2015) states that bridging the development gap between the developed and developing countries, and alleviating poverty to provide a more equitable and sustainable future for all, requires novel and integrated approaches that fully incorporate existing and new scientific knowledge.Wushishi and Kubo (2011) opine that, a literate scientific and technological community can make innovative contributions that could lead to solving major problems such as; disease control, population growth and urbanization. Others include; the digital/information divide, coping with climate changes, solving water crisis, protecting the soil, preserving the forests, fisheries, biodiversity as well as mounting beacons for new ethics of global cooperation.

The move for the implementation of the 9-Year Basic Education Curriculum was a deliberate attempt by the Federal Government of Nigeria (FGN) to provide quality education for all by year 2030 as part of the United Nations (NU) resolutions for the realization of the Sustainable Development Goals (SDGs). The critical target of both the present Nigerian governments' transformation agenda and SDGs has strong indicators of achievement in science and technology. Therefore

the teaching and learning of Basic Science and Technology at the Upper Basic Education level in Nigerian schools is a right step in the right direction (Nwankwo, 2014). According to Igboke (2015), the rationale, objectives and structure of the Basic Science and Technology Curriculum is a typical case of a composite or cluster subject in the Revised 9-Year Basic Education Curriculum (BEC). The Basic Science and Technology Curriculum (BSTC) which is the component of UBE is a product of the restructuring and integration of four Primary and Junior Secondary School (JSS) subjects namely: Basic Science, Basic Technology, Physical and Health Education, and Computer Science/Information Technology (BSTC revised 2012, in NERDC; 2012).

Adegoke (2012)affirms that the classroom teacher is the main human instructional resource that forms the cornerstone in curriculum implementation, the major force and the last person to ensure that all the segments of the curriculum are implemented according to specifications. The non-human instructional resources or facilities on the other hand are the physical material/structures used to facilitate teaching and learning in Basic Science and Technology. These resources include; equipment, buildings, machines, textbooks, posters, charts, models, pen and pencils, furniture, internet and other computer aided multimedia facilities among other things which are utilized by teachers and students in the teaching and learning process (Sambo, 2012). Osita (2014), states that the effectiveness of curriculum implementation is depended on availability and utilization of instructional resources as a panacea for the attainment of educational goals. The author observed that it is not enough for the instructional resources to be available, but the extent of availability and utilization forms the basis for the assessment of an instructional process.

Curriculum is often one of the main concerns in the educational field. What kind of curricula should we offer to learners? Educators and teachers are concerned about what choices are to make about teaching content and methods (Roberts 2015). As for the parents, they would like to know what their children are going to learn. Learners are also concerned about what kinds of content they are going to have in class. Kelly (1999) asserts that "Curriculum" seems to be considered greatly as what teachers are going to teach and, in other words, what learners are going to learn. In fact, "curriculum" is also closely related to how well the learners learn the outcomes. Thus, as an umbrella term, curriculum includes a lot of issues, for example, teaching curriculum, learning curriculum, testing curriculum, administrative curriculum and the hidden curriculum (Shao-Wen 2012). According to Pratt (1994) and Barrow and Milburn (1990), the word "curriculum" is derived from the Latin verb currere, "to run." "Currere" became a diminutive noun and meant a "racing chariot" or "race track." An extension was made by Cicero who associated the term with curriculum vitae that means "the course of one's life." He also associated it with curricula mentis that metaphorically refers to "the educational course of the mind." It was not until the nineteenth century that the term was commonly used in the educational field as a multifaceted concept, constructed, negotiated and renegotiated at a variety of levels and in a variety of arenas. This view reflects the complex and interactive nature of curriculum. Longstreet and Shane (1993) reveal another side of curriculum which requires decision making.

The term implementation is an important building block for successful execution of programmes or projects. In particular, implementation is the sustained procedural approach with associated qualification measures and events aimed at a desired outcome (Jose 2015). According to Adegoke (2015) implementation is the carrying out, execution, or practice of a plan, a method, or any design, idea, model, specification, standard or policy for doing something. As such, implementation is the action that must follow any preliminary thinking in order for something to actually happen. For an implementation process to be successful, many tasks between different departments need to be accomplished in sequence. Companies strive to use proven methodologies and enlist professional help to guide them through the implementation of a system but the failure of many implementation processes often stems from the lack of accurate planning in the beginning stages of the project due to inadequate resources, underutilization of the available resources or unforeseen problems that arise. The concept implementation, generally involves the process through which a proposed project or programme is taken up by some practice.

According to Omiko (2016), curriculum implementation therefore involves several physical elements to be in place especially when implementing a new curriculum. There must be a clearly-defined minimum standards document specifying the requirements for the curriculum, the instructional facilities and resources for curriculum implementation, including the role of the teachers, school administrators, supervisors and the government. Moyinoluwa (2015) stated that the necessary resources have to be available and fully utilized; so that the implementation of a curriculum could move on smoothly. The author insisted that the teacher is first the instructional resource for effective implementation of any curriculum and should be well qualified in his/her area of specialization for a balanced instructional process.According to UBEC (2012), Teachers minimum teaching qualification in Nigeria is the Nigerian Certificate in Education (NCE), which entails that a teacher with higher qualifications such as; B.ED, B.SC, M.ED, M. SC ED in Basic Science, Basic Technology, Physical and Health Education as well as

Computer Science/Information Communication is highly qualified to teach a specific area of the subject.

Hallack (1990) emphasized that the availability of relevant educational resources contribute to academic achievement and that unattractive school buildings, crowded classrooms, non-availability of playing grounds and surroundings that have no aesthetic beauty can contribute to poor academic achievement. Further, Kembui (1995) in a study of relationship between educational resources and students academic performance in Kenya noted a very strong positive significant relationship between instructional resources and academic performance. According to him, schools with more resources that are maximally utilized performed better than schools that are lessendowed. This collaborated the findings of a study by Babayomi (1999) that private schools because of availability, adequacy and excellent utilization of teaching and learning resources performed better than government or public schools that in most cases have the required instructional resources but are underutilized.

Hoop (2010) noted that education in most Sub-Saharan countries faces chronic shortages of teachers and other physical resources. According to him rather than distributing the limited resources available for secondary education uniformly across schools, many governments allocate a relatively large share of available resources to a selected number of secondary schools. Similarly, findings by Nwafor and Eze (2014) in a study on provision of textbooks and physical resources in secondary schools revealed that private secondary schools have better textbook supplies and physical facilities than those government secondary schools. Similarly, an earlier study by Moochi (2012) on utilization instructional resources and secondary school academic performance noted that both human and non- human resources are maximally utilized in private secondary schools than in government schools,because of the stiff supervision mounted by owners of private schools.Ogungbesan (2012) asserted that66.5% of the Basic Science teachers surveyed were not professionally qualified to teach the subject. According to Olayiwola (2014), only 35% of the available instructional resources especially in government schools are utilized by both teachers and students in teaching and learning Basic Science and Technology.In a similar view Odigbo (2015) stated that there is no difference in the extent of availability of instructional resources in government and public schools, utilization of the available instructional resourcesis the major factor hindering effective implementation of Basic Science and Technology curriculum.

The use of instructional materials is inevitable if effective teaching and learning must be achieved. It is only when resources are available and utilized during instruction that scientific knowledge and technological skills could be acquired and applied for community development and the attainment of the Sustainable Development Goals (SDGs) especially in developing counties like Nigeria. However, previous reports by Ogungbesan (2012), Olayiwola (2014) and Odigbo (2015)among others in Nigeria has shown challenges such as inadequate qualified teachers, inadequate instructional resources among other issues with implementation of the single curriculum of these subjects (Basic Science, Basic Technology, Physical & Health Education & Computer Science) that now form Basic Science and Technology. Therefore, at present that these individual subjects areas are merged as one, to what extent are instructional resources available and utilized in government and private schools for effective implementation of the 3-year Upper Basic Science and Technology curriculum.

STATEMENT OF THE PROBLEM

Nigeria as a developing country according to many scholars can only witness a radical break through in Science and Technology if the citizenry have completely received both scientific and technological literacy. That means one important subject in the present Universal Basic Education programme that can assure this both at the lower and upper Basic Education levels is Basic Science and Technology. It is because of this obvious reason that the Presidential Summit on Education (2010),the stakeholders recommendationsIn line with the international best practices,called for a complete formulation of a new structure for primary and junior secondary school curriculum, because of too many subjects offered at these levels in Nigeria which the content of some subjects seem to be duplicated in other subjects (NERDC, 2010). In order to enforce the recommendations of the stakeholders, the content of some subjects such as; Basic Science, Basic Technology, Physical and Health Education and Computer Science was reduced after some of the subjects were compressed and merged (NERDC, 2012). It was on this basis that four different subjects were reshaped and merged to become Basic Science and Technology (Akpan, 2015). This is expected to merge also the instructional resources in these subject areas at all levels in both government and private schools to easy the implementation of the curriculum.In order to solve the curriculum implementation problems such as inadequate qualified teachers, inadequate instructional resources among other issues faced by the individual subject areas as reported previously by Odigbo (2010),Ogungbesan (2012), Olayiwola (2014) among others in Nigeria.The major problem of concern is that, these subjects (Basic Science, Basic Technology, and Physical& Health Education & Computer Science) have now merged as Basic Science and Technology. Therefore; what is the qualification of the teachers handling the four areas of the subject,to what extent are instructional resources available and utilized in government and private schools for effective

implementation of the 3-year Upper Basic Science and Technology curriculum?

Purpose of the Study

The study was aimed at investigating the extent of availability and utilization of instructional resource for the implementation of the 3-year Upper Basic Science and Technology curriculum in North Central Nigeria. Specifically, the purpose of the study was to determine:

1. The qualification of teachers handling the four areas of Basic Science and Technology in government and private schools in North Central Nigeria.
2. The extent Basic Science and Technology instructional resources are available in government and private secondary schools in North Central Nigeria.
3. The extent the available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum.

Research Questions

The following research questions guided the study:

1. What is the qualification of teachers handling the four areas of Basic Science and Technology in government and private schools in North Central Nigeria?
2. To what extent are Basic Science and Technology instructional resources available in government and private secondary schools in North Central Nigeria?
3. To what extentare the available instructional resources utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum?

Hypothesis Ho1.

There is no significant difference in the mean rating scores on the extent to which Basic Science and Technology instructional resources are available in government and private secondary schools in North Central Nigeria.

Hypothesis Ho2.

There is no significance difference in the mean rating scores on the extent to which the available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum.

RESEARCH METHOD

The study is a cross sectional survey of the availability and utilization of instructional resources for the implementation of the 3-year Upper Basic Science and Technology curriculum in North Central Nigeria.The population comprised all 10,688 Basic Science and Technology teachers and 2,703,427 students in North Central Nigeria. The sample consists of 288 teachers and 2,160 students randomly selected in 72 government and private secondary schools in the study area. Basic Science and Technology Teachers Qualification Inventory (BSTTQI) and Basic Science and Technology Classroom Observation Schedule (BSTCOS) were used for data collection. The instruments were validated by three experts, two in Science Education and one in Test and Measurement. The reliability coefficient of the instrument was determined using Crombach alpha and internal consistence of instrument was obtained as 0.92, and 0.82,respectively. Each of the instruments was developed on a modified Likert-type four point rating scale of 4, 3, 2, and 1 as follows: each item in clusters A and B has; Great Extent (GE) = 4pionts = 3.50 – 4.00, Moderate Extent (ME) = 3pionts = 2.50 – 3.49, Less Extent (LE) = 2pionts = 1.50 – 2.49, No Extent (NE) = 1piont= 0.50 – 1.49. The data collected was analyzed using simple percentage, mean and standard deviation.

RESULTS

Question 1. What is the qualification of teachers handling the four areas of Basic Science and Technology in government and private schools in North Central Nigeria?

Table 1.Percentage proportion of the qualification of teachers handling the four areas of Basic Science and Technology in government and private schools in North Central Nigeria

S/N	Qualification of teachers in the four areas of BST	Number of Teachers = 288				Decision
		GSS		PSS		
		No	%	NO	%	
1	NCE	23	7.9	21	7.3	Qualified
2	OND	28	9.7	43	14.9	Unqualified
3	HND	14	4.9	20	6.9	Unqualified
4	B.ED	18	6.3	18	6.3	Qualified
5	B.SC.ED	04	1.4	6	2.1	Qualified
6	M.ED	05	1.7	10	3.5	Qualified
7	M.SC.ED	04	1.4	6	2.1	Qualified
8	Others(NCE,OND, B.Ed,M.ED in Bio, phy, Chem, Geo, Engretc)	48	16.7	20	6.9	Unqualified

Key: BST = Basic Science and Technology, GSS = Government Secondary Schools, PSS = Private Secondary Schools

Percentage Summary of the qualification of teachers handling the four areas of BST

GSS	Qualified	Unqualified	PSS	Qualified	Unqualified
	18.7%	31.3%	21.3%	28.7%	

Total Qualified Teachers GSS + PSS = 40%

Total Unqualified Teachers GSS + PSS = 60%

The result in Table 1 of research question 1 revealed that the percentage proportion of qualified and unqualified teachers in both government secondary schools (GSS) and private secondary schools (PSS) is not significantly different with 18.7% and 21.3% for qualified teachers and 31.1% and 28.7%for unqualified teachers respectively. However, the total percentage proportion for qualified teachers stood at 40% less than that of qualified teachers which is 60% respectively.

Question 2. To what extent are Basic Science and Technology instructional resources available in government and private secondary schools in North Central Nigeria?

Table 2. *The extent Basic Science and Technology instructional resources available in government and private secondary schools in North Central Nigeria*

S/N	Instructional Resources in BST	GSS Mean	SD	Decision	PSS Mean	SD	Decision
1	Posters	2.68	1.25	ME	2.75	1.13	ME
2	Charts	2.76	1.12	ME	2.80	1.30	ME
3	Textbooks	3.80	1.45	GE	4.05	1.31	GE
4	Laboratories	1.46	0.45	LE	2.68	1.23	ME
5	Models	2.70	1.17	ME	2.79	1.22	ME
6	Fields/Pitch	3.65	1.30	GE	2.50	1.21	ME
7	Balls	2.60	1.33	ME	2.70	1.25	ME
8	First Aid Box	2.72	1.11	ME	3.40	1.31	GE
9	Magazines	2.55	1.25	ME	2.60	1.42	ME
10	Microscope	2.63	1.15	ME	2.75	1.26	ME
11	Thermometer	1.40	1.12	LE	2.53	1.35	ME
12	ICT facilities	1.53	1.21	LE	2.57	1.23	ME
Composite Mean 2.54		**2.84**					

Key: BST = Basic Science and Technology

GSS = Government Secondary Schools

PSS = Private Secondary Schools

GE = Great Extent, ME = Moderate Extent, LE = Less Extent & NE = No Extent

The result in Table 2 of research question 2 showed that, both the government secondary schools (GSS) and private secondary schools (PSS) have instructional resources for the implementation of the 3-year Upper Basic Science and Technology curriculum moderately. However, the PSS have slightly more instructional resources available than the GSS with the composite means of 2.54 and 2.84 respectively.

Question 3. To what extent are the available instructional resources utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum?

Table 3. *The extent available instructional resources utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum?*

S/N	Instructional Resources in BST	GSS Mean	SD	Decision	PSS Mean	SD	Decision
1	Posters	2.46	1.05	LE	2.80	1.21	ME
2	Charts	2.50	1.28	ME	2.64	1.10	ME
3	Textbooks	3.65	1.25	GE	3.90	1.35	GE
4	Laboratories	1.21	1.18	LE	2.71	1.29	ME
5	Models	2.67	1.10	ME	4.05	1.36	GE
6	Fields/Pitch	3.00	1.20	GE	2.62	1.41	ME
7	Balls	2.72	1.15	ME	2.80	1.15	ME
8	First Aid Box	2.37	1.01	LE	3.60	1.41	GE
9	Magazines	2.43	1.17	LE	2.80	1.32	ME
10	Microscope	2.33	1.25	LE	2.65	1.13	ME
11	Thermometer	1.46	1.20	LE	2.61	1.52	ME
12	ICT facilities	2.33	1.19	LE	2.68	1.33	ME

Composite Mean	**2.43**	**3.00**

Key: BST = Basic Science and Technology

GSS = Government Secondary Schools

PSS = Private Secondary Schools

GE = Great Extent, ME = Moderate Extent, LE = Less Extent & NE = No Extent

The result in Table 3 of research question 3 revealed that, the private secondary schools (PSS) utilize the available instructional resources for the implementation of the 3-year Upper Basic Science and Technology to a moderate extent with a composite mean of 3.00. While the government secondary schools (GSS) utilize the available instructional resources to a less extent with a composite mean of 2.43 respectively.

Research Null Hypothesis one (HO1)

There is no significant difference in the mean rating scores on the extent Basic Science and Technology instructional resources are available in government and private secondary schools in North Central Nigeria.

Variables	N	Mean	SD	T	df	P	Level of Sig	Dec
Teac/Stds GSS	1224	2.5400	0.5206	0.055	65	0.073	0.05	N
PSS	1224	2.8433	0.5152					

The t-test of independent sample on the extent Basic Science and Technology instructional resources are available in government and private secondary schools recorded t-test value of 0.055 with a p-value of 0.073 which is greater than 0.05 level of significance (p=0.073>0.05). That means the null hypothesis is not rejected.This means that, there is no significance difference on the extent Basic Science and Technology instructional resources are available in government and private secondary schools.

Hypothesis Ho2.

There is no significance difference in the mean rating scores on the extent the available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum.

Variables	N	Mean	SD	T	df	P	Level of Sig	Dec
Teach/Stds GSS	1224	2.4275	0.5411	0.055	65	0.033	0.05	S
PSS	1224	2.9883	0.5831					

The t-test of independent sample on the extent the available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum recorded t-test value of 0.055 with a p-value of 0.033 which is less than 0.05 level of significance (p=0.033<0.05). That shows that the null hypothesis isrejected. This implies that, there is a significance difference on the extent the available instructional resources are utilized in government and private secondary schools for effective implementation of the 3-year Upper Basic Science and Technology curriculum.

DISCUSSION

The result showed that the total number ofqualified and unqualified teachers in government secondary schools (GSS) and private secondary schools (PSS) in the four areas of Basic Science and Technology is almost the same with 18.7% and 21.3% for qualified teachers and 31.1% and 28.7% for unqualified teachers respectively. However, the total percentage proportion for qualified teachers in the zone stood at 40% less than that of unqualified teachers which was 60%. This result is in line withOgungbesan (2012) who asserted that 66.5% of the Basic Science teachers surveyed were not professionally qualified to teach the subject. The result further revealed the extent Basic Science and Technology instructional resources are available in government and private secondary schools in North Central Nigeria. The result agreed with the findings of Odigbo (2015) who stated that there is no difference in the extent of availability of instructional resources in government and private schools. Also, the result showedthe extent available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum with t-test value of 0.055 and a p-value of 0.033 which is less than 0.05 level of significance (p=0.033<0.05). This shows that the null hypothesis is rejected; hence there is significant difference in the mean rating scores on the extent the available instructional resources are utilized for effective implementation of the 3-year Upper Basic Science and Technology curriculum in government and private secondary schools. The result is in support of Mooch (2012) who observed that both human and non-human resources are maximally utilized in private secondary schools than in government schools, because

of the stiff supervision mounted by owners of private schools.

CONCLUSION

Going by the findings, it is concluded that 60% of the teachers handling the four areas of Basic Science and Technology are not qualified. The extent of availability of instructional resources such as textbooks, posters, charts, laboratories, and ICT facilities in both government and private schools is not significantly different. However, private secondary schools utilize the available instructional resources moderately against government secondary schools that utilize the resources to a less extent.

Recommendations

Based on the findings of the study, the following recommendations are made.

1. Government through the Ministry of Education (MOE), State Universal Basic Education Boards (SUBEB) and other relevant agencies should ensure that more qualified teachers are employed in four areas of Basic Science and Technology for effective implementation of the curriculum.
2. Government and other stakeholders should ensure even distribution of instructional resources in government and private schools.
3. The monitoring units at the MOE and SUBEB should intensify the supervision of schools especially those owned by government to ensure that the available instructional resources are utilized to a great extent.

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