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ASSESSMENT OF THE AVAILABILITY, ADEQUACY AND UTILIZATION OF INSTRUCTIONAL MATERIALS IN BASIC SCIENCE AND TECHNOLOGY CURRICULUM IMPLEMENTATION

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Abstract

This study investigated the availability, adequacy and utilization of instructional materials in the teaching and learning of Basic Science and Technology (BST) in Junior Secondary School students in Uhunmwonde Local Government Area of Edo State, Nigeria. Three research questions were raised to guide the study. The sample for the study is Junior Secondary School teachers from seventeen (17) public Junior Secondary Schools selected from a population of 102 teachers. The descriptive survey research design was adopted for the study while the simple random sampling technique was used in selecting the sample. A 20-item Basic Science and Technology Curriculum Instructional Materials (BSTCIM) checklist was adopted for the study. A pilot administration of the instrument was conducted [redacted] to test the reliability of the instrument and a reliability coefficient of 0.784 was obtained using Cronbach's alpha reliability method. The instrument was administered to Junior Secondary Schools teachers by the researchers after permission from the schools' authorities and thereafter they were collected and collated for analysis. The data was analyzed using descriptive

Keywords: Instructional materials, Availability, Adequacy, Utilization, Basic Science and Technology

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statistics of frequency counts and percentages presented in tables. The study revealed that instructional materials are available though not adequate. The study also revealed that the available instructional materials are not effectively utilized by the teachers. It is recommended among others that school management should always review the availability and adequacy of instructional materials and make useful requests/ provision where and when applicable, the utilization of instructional materials should be regularly monitored for effectiveness.

Introduction

Basic Science and Technology (BST) is the practical use of scientific ideas or concepts to provide remedy to technological challenges. It deals with the individual learner's acquisition of basic knowledge, skills, values, and attitudes that are useful for scientific development and technological emancipation (Achuba, Eraikhuemen & Oyakhirome, 2024). Basic Science and Technology is the aspect of education which leads to acquisition of practical and applied skills as well as basic scientific knowledge (National Policy of Education, FRN 2013).

BST is a core subject offered at the six years of primary school (lower and middle basic) and three years of junior secondary school (upper basic) in Nigeria to achieve scientific and technological prowess as a plan for a firm basic scientific education foundation for her citizens from childhood. This means that the teaching and learning of BST would enable junior secondary schools students to build up and concretize their primary school basic science and technology knowledge and establish the bedrock for the study of science subjects such as Biology, Chemistry, Physics at the senior secondary school level. But these cannot be achieved without the curriculum, hence, the introduction of the Basic Science and Technology Curriculum (BSTC).

The curriculum in use before the year 2012 has a lot of challenges such as teaching and learning of four school subjects: Basic science, Basic technology, Physical and Health Education (PHE) and Information Communication and Technology (ICT) as separate subjects. Furthermore, there were issues of duplication of concepts within and cross subjects (overloaded curriculum), use of traditional teaching strategies, the holistic view of science for better understanding of contemporary

society was not promoted and lastly, emergent issues such as globalization, security challenges, gender sensitivity among others that are of national and global concerns were not infused in the curriculum. These challenges necessitated the revision of the curriculum.

The revision of Basic Science and Technology Curriculum (BSTC) was implemented by Nigerian Educational Research and Development Council (NERDC) in the year 2012 to address the flaws of the previous curriculum. In addition, the Revised Basic Science and Technology Curriculum (BSTC) was designed to enable the learners to develop interest in science and technology; acquire basic knowledge and skills in science and technology; apply scientific and technological knowledge and skills to meet science and technology; take advantage of the numerous career opportunities provided by science and technology; become prepared for further studies in science and technology; avoid drug abuse and related vices; and be safety and security conscious (NERDC,2012).

To achieve the stated objectives of the subject, BST, availability, adequacy and utilization of instructional materials are required in the teaching and learning process. Students and teachers need to possess the necessary instructional materials and utilize them as guides. Instructional materials are materials used by the teacher to make his lessons meaningful to the learners ensuring that the teaching/learning objectives are achieved. According to Isma'il and Lukman (2022), instructional materials are all the things or materials that may be used by a teacher as part of instructional process to deliver effective and successful teaching that can facilitate positive students' learning outcomes. Instructional materials are materials which assist teachers to make their lessons explicit to learners (Alhassan, Dangari, Ekunke & Badamasi, 2023).

Instructional materials make teaching and learning process easy, more meaningful and quite understandable. Instructional materials have the tendency to enable the learners to acquire the appropriate levels of literacy (manipulative, communicative and lifelong skills). Therefore, the availability and adequacy of instructional materials and facilities such as textbooks, computers, laboratories and workshops among others are critical. The science teacher requires to effectively utilize instructional materials in illustrating, emphasizing and explaining his lesson for ease of comprehension and possible application to real life situations. The availability, adequacy and utilization of instructional materials encourage active learning among students because it allows students and

teachers to participate in concrete learning activities that develop the concept of self-evaluation.

Instructional materials can be in the form of **print materials** (textbooks, handouts, charts, posters, workbooks, practical books, magazines, newspapers, self-learning modules and other printed resources), **audio materials (**audio recordings, CD ROM, podcasts, and audio-visual presentations), **visual materials (**simulations, diagrams, videos and other visual aids), **digital materials** (multimedia applications, interactive software and educational websites) and hands-**on materials (**equipment, kits, and real objects used for practical works).

The use of instructional materials is crucial for effective implementation of the curriculum. However, the importance of instructional materials in the teaching and learning process should be considered in terms of their relevance to learning expectations, how they align with curriculum standards and objectives, and their engagement of students and promotion of effective learning. These importances or considerations can be summarized in nine ways as follow:

Relevance: Instructional materials should be relevant to the teaching and learning process by addressing the specific learning expectations and the curriculum theme.

Curriculum Alignment: The instructional materials should align with the standards and objectives of the curriculum.

Accuracy and Currency: Instructional materials should be able to be used to check for accuracy of information and ensure that the information presented is current and relevant to the scientific knowledge and understanding of concepts.

Variety and Choice: Instructional materials should be able to be used in different formats to meet diverse learning needs, styles and preferences.

Clarity: Instructional materials are used to ensure that instructions are clear and easy to understand by the intended recipients or target audience.

Availability: Instructional materials should always be adequately available to teachers and students for use and for proper integration in the teaching and learning process.

Accessibility: The design and use of instructional materials should consider the needs of the end -users irrespective of the learners' abilities and ensure that they can access the materials.

Interactive Objects: Instructional materials should be able to engage the learners actively in learning by using interactive objects such as simulations, experiments, and hands-on activities among others.

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Real-World Relations: Instructional materials have the propensity to relate theories such as concepts and principles to real-world applications and situations that make learning more appealing and effective to the learners.

Despite the commendable importance of instructional materials in learning, studies have shown that most of the Basic Science and Technology instructional materials are not available and the few that are available are not adequate (Owodunni, Tukura & Banjo ,2018; Ayandele, 2021; Chima & Mbaegbu ,2021). Mupa and Chinooneka (2015) lamented the poor state of instructional materials in schools as their study revealed that schools lack adequate textbooks, revision books and resource books to extend children's knowledge. Ajemba, Ahmed, Ogunode and Olatunde (2021) revealed that the shortage of instructional materials for science teaching and learning in Nigerian schools has been a major issue of concern and that many science teachers do not have adequate instructional materials to deploy for teaching and this is affecting the learning processes of the students. Additionally, Chima and Mbaegbu (2021) revealed that some of the instructional materials which include, chalk, chalk board, models, charts, teacher's guide, self-learning modules, textbooks, workbooks among others are grossly inadequate in schools especially during the post COVID-19 era.

However, Alhassan, Dangari, Ekunke and Badamasi (2023) found a favourable effect of instructional materials on students' achievement in basic science concepts. Similarly, Abidoye and Abidoye (2023) revealed that the use of science instructional materials has a great effect on various school students' academic performance. Isma'il and Lukman (2022) reported a similar result for biology when they found that the availability and adequacy of the instructional materials have positive impact on the effective teaching and learning of biology. They further explained that instructional materials can improve the academic performance of secondary school students if they are properly being utilized.

In all these studies, a woeful state of availability, adequacy and utilization of instructional materials in secondary schools were revealed and this trend is worrisome and detrimental to the educational system. It is on this note that the researchers are prompted to investigate the availability, adequacy and utilization of instructional materials in basic science and technology curriculum implementation in Uhunmwonde Local Government Area of Edo State

Statement of the Problem

Instructional materials help in arousing and sustaining student's interest in learning and enable them in concretizing ideas and stimulating their imaginations as well as providing the learners with essential knowledge and skills. Despite the commendable importance of instructional materials in curriculum implementation, it has been noted from observation and the studies cited that instructional materials are not available and that the few available ones are not effectively utilized, and this could have some adverse implications on teaching effectiveness and students' learning outcomes.

The instructional materials drawback needs to be swiftly addressed as most teaching strategies employed by teachers seem to be mainly focused on the content and not the diagnostic techniques. However, there is limited information on instructional materials availability, adequacy and utilization situations in Uhunmwonde Local Government Area based on available literature. This creates a gap to assess the instructional materials challenge in the context of Edo State, Nigeria. Hence this study was designed to compensate for the limitations of the prior studies since it was conducted in Uhunmwonde Local Government Area, Edo State of Nigeria.

Research Questions

The following questions were raised to provide proper guidance for this study.

1. What is the availability of instructional materials for the teaching and learning of Basic Science and Technology?
2. What is the extent of the adequacy of instructional materials for the teaching and learning of Basic Science and Technology?
3. What is the level of the utilization of instructional materials for the teaching and learning of Basic Science and Technology?

Purpose of the Study

The precise objectives of the study are to:

1. assess the availability of instructional materials for the teaching and learning of Basic Science and Technology.
2. determine the adequacy of instructional materials for the teaching and learning of Basic Science and Technology.

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3. ascertain the utilization of instructional materials for the teaching and learning of Basic Science and Technology

Significance of the Study

It is the researchers' belief that by conducting this study on assessment of instructional materials in the teaching and learning of Basic Science and Technology in Junior Secondary Schools in Uhunmwonde Local Government Area of Edo State, the findings of this study would be beneficial to students, BST teachers, teachers in other science related subjects, researchers and curriculum planners.

Lastly, education authorities, school proprietors, school principals and Ministry of Education will benefit from this study as it would enable them to x-ray the effectiveness of students' learning and make useful and adequate suggestions and recommendations that will improve availability, adequacy and utilization of instructional materials in curriculum implementation.

Scope and Delimitation of the Study

The scope of this study is concerned with the assessment of the availability, adequacy and utilization of instructional materials in BST curriculum implementation in Uhunmwonde Local Government Area of Edo State. This study was delimited to JSS teachers in public schools in Uhunmwonde Local Government Area of Edo State.

Methodology

This study adopted the descriptive survey research design. This design involves obtaining information concerning the status of a phenomenon to describe "what exists" with respect to variables in a situation. It is of great relevance as it is the researchers' intention to collect data to explore the availability, adequacy and utilization of instructional materials of BST curriculum implementation in Uhunmwonde Local Government Area.

The population of this study is 102 teachers at all Junior Secondary Schools (JSS) in the seventeen public schools in Uhunmwonde Local Government Area of Edo state.

The sample for the study comprises 10 teachers and it was selected using simple random sampling technique whereby ten (10) percent of the population were selected.

The research instrument for the study was a twenty (20) item checklist which seeks information on availability, adequacy and utilization of instructional materials in BST curriculum implementation to answer research questions one to three. The instrument is referred to as Basic Science and Technology Curriculum Instructional Materials (BSTCIM) and it was divided into two (2) sections. Section A consists of schools' demographic data while section B consists of items on availability, adequacy and utilization of instructional materials for Basic Science and Technology teaching and learning. In the sampled schools, the researchers requested the teachers for the inventory book to check the instructional materials in accordance with the prepared checklist for them to tick as appropriate [x] as only one option for each of the parameters : Available(A), Not Available (NA) for availability, Adequately Available (AA), Not adequately Available, (NAA) for adequacy and Always Utilized (AU) and Not always Utilized (NAU) for Utilization.
The instrument was validated by one curriculum expert and two BST teachers, and their corrections were incorporated in the final copy of the instrument.
To determine the reliability of the instrument, a pilot test was carried out by administering twenty copies of the instrument to twenty respondents who were part of the study population but not part of the study sample. The completion of the checklist was closely monitored by the researchers and the filled instrument was collected from the respondents and subjected to Cronbach alpha statistics. Cronbach alpha coefficient of 0.784 was obtained and this revealed a very high instrument's reliability.
The instrument was administered by the researchers to the teachers, and it was 100% retrieved.
The data collected were analyzed using frequency counts and percentages presented in tables. On the availability of instructional materials, the checklist was set on the criterion of 50% for decision-making. Item with 50% response and above were weighed as available while items below 50% were regarded as not available. Adequacy of the available instructional materials was regarded by one instructional material per 10 students or below as adequate and one instructional material for more than 10 students is not adequate while items with 50% rating and above were weighed as utilized and items below 50% were regarded as not utilized.

Results

This provided answer and results to the research questions that backed up the study. It discussed the findings of the study and supported the findings with other existing results of previous findings in the related area of study.

Research Question 1: What is the availability of instructional materials for the teaching and learning of Basic Science and Technology?

Table 1: Frequency and Percentage distribution of the availability of instructional materials for the teaching and learning of Basic Science and Technology

S/N	Instructional Materials	Available		Not Available		Decision
		Frequency	Percentage (%)	Frequency	Percentage (%)	
1	**Chalkboards/White boards**	10	100			Available
2	**Chalk/Board makers**	10	100			Available
3	**Textbooks**	8	80	2	20	Available
4	**Computers**	6	60	4	40	Available
5	**Television/ /motion pictures**	2	20	8	80	Not available
6	**Radio sets**	3	30	7	70	Not available
7	**Display boards**	9	90	1	10	Available
8	**Posters**	7	70	3	30	Available
9	**Real objects / models**	3	30	7	70	Not available
10	**Charts**	8	80	2	20	Available
11	**Projectors**			10	100	Not available
12	**Films strip**	1	10	9	90	Not available
13	**Video Recorder**	2	20	8	80	Not available
14	Workbooks	7	70	3	30	Available
15	Practical books	9	90	1	10	Available
16	Fire extinguisher	4	40	6	60	Not available
17	French curve	3	30	7	70	Not available
18	Thermometer	7	70	3	30	Available
19	Hammer	6	60	4	40	Available
20	Sports kits	2	20	8	80	Not available
	Overall	5.35	53.5	4.65	46.5	Available

Source: Field work, 2025

A cursory look at the results revealed in Table 1 shows that only chalkboards/white boards and chalk/board makers are 100% available. Textbooks, display boards, computers, posters, charts, workbooks, practical books, thermometer and hammer are over 50% available. It is explicit that 11 items out of the 20items are

available, and this implies that 55% of instructional materials are available. However, it is evident from the result that only projector that is 100% not available in all the schools. Television/motion pictures, Radio sets, real objects/ models, films strip, video recorder, fire extinguisher, French curve and sports kits are not available.

In overall, the average percentage is 53.5 which is above the criterion percentage of 50 set for this study. Based on the result in Table 1 above, it is obvious that Junior secondary schools in Uhunmwonde local government area in Edo State have instructional materials for BST curriculum implementation.

Research Question 2: What is the extent of adequacy of instructional materials for the teaching and learning of Basic Science and Technology?

Table 2: Frequency and Percentage distribution of the availability of instructional materials for the teaching and learning of Basic Science and Technology

S/N	Instructional Materials	Adequately Available		Not Available	Adequately	Decision
		Frequency	Percentage (%)	Frequency	Percentage (%)	
1	**Chalkboard/White board**	10	100			Adequate
2	**Chalk/Board makers**	10	100			Adequate
3	**Textbooks**	6	60	4	40	Adequate
4	**Computers**	3	30	7	70	Not adequate
5	**Television/ /motion pictures**	1	10	9	90	Not adequate
6	**Radio sets**	2	20	8	80	Not adequate
7	**Display boards**	1	10	9	90	Not adequate
8	**Posters**	7	70	3	30	Adequate
9	**Real objects/ models**	3	30	7	70	Not adequate

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S/N	Instructional Materials	Adequately Available		Not Available	Adequately	Decision
10	**Charts**	2	20	8	80	Not adequate
11	**Projectors**			10	100	Not adequate
12	**Films strip**	1	10	9	90	Not adequate
13	**Video Recorder**	2	20	8	80	Not adequate
14	Workbooks	8	80	2	20	Adequate
15	Practical books	7	70	3	30	Adequate
16	Fire extinguisher	4	40	6	60	Adequate
17	French curve	3	30	7	70	Not adequate
18	Thermometer	7	70	3	30	Adequate
19	Hammer	6	60	4	40	Adequate
20	Sports kits	2	20	8	80	Not adequate
	Overall	4.1	41	5.1	59	Not adequate

Source: Field work, 2025

Table 2 reveals that only chalkboards/white boards and chalk/board makers are 100% adequately available. Textbooks, posters, charts, workbooks, practical books, thermometer and hammer are over 50% in terms of adequacy. The result shows that 9 items out of the 20items are adequately available, and this implies that 45% of instructional materials are adequately available. Though 55% of the materials are not adequately available, projector recorded 100% inadequacy in terms of availability in all the schools. Television/motion pictures, Radio sets, real objects/ models, films strip, video recorder, fire extinguisher, French curve and sports kits are not adequately available.

The average rating is 41% adequacy, and this is below the criterion percentage of 50 set for this study. This implies that instructional materials are not adequately

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available. The overall rating for inadequacy is 59%. Based on the analyses above, it became very clear that Junior secondary schools in Uhunmwonde local government area in Edo State lack adequate instructional materials for basic science and technology teaching and learning.

Research Question 3: What is the level of utilization of instructional materials for the teaching and learning of Basic Science and Technology?

Table 3: Frequency and Percentage distribution of the utilization of instructional materials for the teaching and learning of Basic Science and Technology

S/N	Instructional Materials	Always utilized		Not always utilized		Decision
		Frequency	Percentage (%)	Frequency	Percentage (%)	
1	**Chalkboard/White board**	10	100			Utilized
2	**Chalk/Board makers**	10	100			Utilized
3	**Textbooks**	8	80	2	20	Utilized
4	**Computers**	3	30	7	70	Not utilized
5	**Television/ /motion pictures**	2	20	8	80	Not utilized
6	**Radio sets**	1	10	9	90	Not utilized
7	**Display boards**	4	40	6	60	Not utilized
8	**Posters**	**7**	70	3	30	Utilized
9	**Real objects/ models**	3	30	7	70	Not utilized
10	**Charts**	2	20	8	80	Not utilized
11	**Projectors**			10	100	Not utilized
12	**Films strip**			10	100	Not utilized
13	**Video Recorder**			10	100	Not utilized

S/N	Instructional Materials	Always utilized		Not always utilized		Decision
14	Workbooks	8	80	2	20	Utilized
15	Practical books	7	70	3	30	Utilized
16	Fire extinguisher	4	40	6	60	Not utilized
17	French curve	3	30	7	70	Not utilized
18	Thermometer	7	70	3	30	Utilized
19	Hammer	3	30	7	70	Not utilized
20	Sports kits	2	20	8	80	Not utilized
	Overall	4. 2	42	5.8	58	Not utilized

Source: Field work, 2025

Table 3 indicates that only chalkboards/white boards and chalk/board makers are 100% utilized while projector, filmstrip and video recorder are not 100% utilized. Textbooks, posters, workbooks, practical books and thermometer are always utilized and each of them has a rating above 50% (criterion rating). It therefore implies that 7 items out of the 20 items are always utilized, and this implies that 42% of instructional materials are utilized. Display boards, charts, computers, television/motion pictures, Radio sets, real objects/ models, fire extinguisher, French curve, sports kits and hammer are not utilized. The average percentage of 58 achieved for non-utilization of instructional materials is high and it means that only few materials are utilized in the teaching and learning of basic science and technology at Junior secondary schools in Uhunmwonde local government area in Edo State.

Discussion of findings

This study investigated, "availability, adequacy and utilization of instructional materials for the teaching and learning of Basic science and technology. The study

was guided by three research questions. Appropriate descriptive statistics of frequency and percentage were used to answer the research questions. The result from the research question one, table 1on the availability of instructional materials for the teaching and learning of Basic Science and Technology, revealed that the availability of the required instructional materials for the teaching and learning of basic science and technology is above 50% .This implies that they are averagely available in junior secondary schools in Uhunmwonde Local Government Area and this result agrees with the findings of Ajemba,et al(2021)that instructional materials are available .

From question 2, table 2, the available instructional materials are not adequate for the teaching and learning of basic science and technology in junior secondary schools in Uhunmwonde Local Government Area. This study has shown that most of the Basic Science and Technology instructional materials are not available and the few that are available are not adequate and this is in conformity with the result of prior studies (Mupa & Chinooneka ,2015; Owodunni, et al ,2018; Ayandele, 2021; Chima & Mbaegbu ,2021).

The result of question 3 in Table 3 revealed that the available instructional materials are grossly underutilized for the teaching and learning of basic science and technology in junior secondary schools in Uhunmwonde Local Government Area. This result conforms with the findings of previous studies (Isma'il & Lukman, 2022; Alhassan, et al, 2023; Abidoye & Abidoye,2023).

Conclusion/Recommendations

From the findings and discussion of the study, it is obvious that some of the instructional materials required for effective implementation of Basic Science and Technology are available while others are not. The available instructional materials are not adequate, and they are not always utilized for the teaching and learning of Basic Science and Technology in junior secondary schools in Uhunmwonde Local Government Area, Edo State.

These findings have some educational implications for students, teachers, curriculum developers and curriculum planners. It can be implied from the findings that the assessment of the instructional materials Basic Science and Technology can enhance effective learning as they help to identify and improve teachers' teaching strategies and students' learning effectiveness in BST.

The following recommendations were made based on the findings from this study:

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i) Secondary schools should be adequately equipped with enough relevant and recommended instructional materials for effective curriculum implementation.
ii) Instructional materials should be made available in schools and teachers should be encouraged to use them during teaching.
iii) Government should establish instructional materials centres and laboratory in all schools where instructional materials are kept.
iv) School authorities should insist on the use of various teaching methods which lead to effective utilization of instructional materials.
v) Government should employ teachers who are professionally trained and competent enough to improvise and utilize instructional materials.
vi) Incentive should be given to teachers who utilize instructional materials during teaching.
vii) Stakeholders, especially parents and Ministry of Education should work to regularly make instructional materials available to the students/schools.
viii) School management should always review the availability and adequacy of instructional materials and make useful requests/provisions where and when applicable.
ix) The utilization of instructional materials should be regularly monitored for effectiveness.

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