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Assessment of Instructional Materials in Technical Colleges of Adamawa State, Nigeria

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Abstract
Instructional materials are those objects, prints or sounds that assist the teacher to achieve the objectives of his lessons. Their roles within the classroom interaction have been recognized by educationists in all fields, not excepting building technology. However, instructional materials must be appropriate, in tune with ages and adequate if they are to serve their purposes. With this in mind, the availability, adequacy and currency of building technology instructional materials wereinvestigated among two technical colleges of Adamawa State, Nigeria. The study adopted the survey as its research design, and the questionnaire as the principal method of data collection respectively. The obtained data was subjected to percentage grading for simplicity of interpretation, and because the target was whether these materials were there or not. The study found that the colleges have either none of the 47 assumed necessary instructional materials, or where there were, they were not proportional to the population of learners. Moreover, the level of improvisation among building technology teachers was found to be very low, consequently further lowering the already low count of instructional materials. The study, therefore, recommended, among others, that parents must lend hands in the procurement of instructional materials and teachers undergo further sensitization and training in improvisation of building technology instructional materials.

KEYWORDS: Instructional Materials, Improvisation, Adequacy, Currency, Building Technology

I. Introduction

Instructional materials are the contents or information conveyed within a course (Karen, 2024). These include the lectures, readings, textbooks, multimedia components, and other resources in a course. The best instructional materials align with all other course elements, including the learning objectives, assessments, and activities.

Instructional materials in Building Technology include traditional resources, graphic organizers, and teacher-made resources. Traditional resources like textbooks, anthologies, and workbooks provide structured educational experiences. Graphic organizers, often created by students, help organize information effectively. Teacher-made resources such as worksheets and handouts are materials instructors create to test students' knowledge or support their learning methods. These instructional materials play a crucial role in teaching and learning within the field of building technology.

Instructional materials, including technology, are essential tools in building technology education, offering a diverse range of resources that can significantly impact the learning process by enhancing engagement, collaboration, and the overall effectiveness of teaching and learning in this field.

Statement of the problem

The place of instructional materials in teaching, generally, has long been recognized. The acknowledgement of the relevance of instructional materials in teaching building technology courses generated lots of studies. For example, Adekemi, Johnson and Cyril (2022) investigated the impact of instructional materials on teaching methods and on academic performance of senior secondary schools' civic education students, and found that instructional materials have significant effects on teaching methods, and that they better academic performance.

Another study is that of Umar, Ossom and Egbita (2020); they investigated the effects of visual instructional materials on students' performance in building technology of technical colleges in Niger state. The study revealed that there is significant difference in academic performance of students in the control and experimental groups, where the experimental group were taught using instructional materials, as the control group without.

The work of Semeton (2020) investigated the availability, utilization and skill level of

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instructional materials production by secondary school teachers. The study found that there is a relatively low availability of instructional materials and average skilled teachers in the production of instructional materials for teaching in secondary schools.

On their part, Brioso, Calderon-Hernandez and Fuentes-Hurtado (2021), examined using new tools for building construction teaching during the sanitary emergency. The study found that the tools used in classes and laboratories were very useful and that they had the perception that it was very similar to a real project design, planning and execution.

These works cited, here above; however, do not appear to give a complete assessment of the availability, adequacy and relevance of building technology instruction materials in Nigerian technical colleges, as none of them focuses on empirical assessment of the availability, adequacy and relevance of building technology instruction materials in Nigerian technical colleges. Thus, this study is conceived to determine the adequacy, currency and relevance of instructional materials to teach building technology courses. The study expects to address the challenging question of: "Are there adequate, current and relevant building technology instruction materials in Nigerian technical colleges"?

Aim and Objectives

The study aims at identifying the building technology instructional materials available at the Adamawa State Government technical colleges. To achieve this goal, the study sets the following objectives:

a). Identify the available building technology instructional materials in Adamawa State Government technical colleges
b). Evaluate the currency of the available building technology instruction materials in Adamawa State Government technical colleges
c). Determine the level of adequacy of instructional materials available in Adamawa State Government technical colleges.

II. Literature Review

Building technology is a science discipline that deals with the technology of building processes, their mechanization, labor content, choice optimization, health and safety at work, not excluding environmental protection. The theory of building process is further developed in preparation and construction-manufacturing process realization during construction site operations.

Building technology encompasses the diverse array of technical knowledge, methods, materials, systems, and practices employed in the design, construction, and maintenance of buildings and other built structures. It involves the application of engineering principles, architectural expertise, and advancements in materials science, construction techniques, and sustainable practices to create safe, functional, efficient, and aesthetically pleasing spaces.

This multidisciplinary field encompasses various aspects, including structural systems, materials science, HVAC (Heating, Ventilation, and Air Conditioning); electrical and plumbing systems, energy efficiency, smart building technologies (such as IoT (Internet of Things), environmental considerations, and construction management techniques.

Building technology aims to enhance the performance, durability, safety, and sustainability of structures while adapting to evolving societal needs, technological advancements, and environmental challenges. It encompasses innovations that optimize construction processes, improve energy efficiency, and prioritize environmentally friendly practices to create buildings that meet both present and future demands.

Teachers of Building Technology

Teachers of building technology education comprises of teachers and instructors that are teaching in secondary schools. Oladunjoye (2018) states that a building technology educator is a person who holds a degree in building technology education from a recognized university or an NCE (Nigerian Certificate of Education) specializing in building technology.

He stated further that holders of NCE from cognized colleges of education in building technology education are competent to teach building technology subject programmes. In the same vein Timya, Wetnwan &Bewaran (2019) viewed building technology education teacher as a person who has undergone a 4- year programme in a reputable university or 3- year programme through NCE and is certified as competent for the award of Bachelor's degree/NCE in building technology education, after meeting the requirements of the institution and the department (Oladunjoye, 2018).

Building technology education teachers play important role in the teaching and learning of – building technology education subject as they are professionally equipped to impart manipulation skills for employment of the learners. It is therefore important that the building technology teacher

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should be conversant with different instructional materials and strategies. The variety of instructional materials and strategies available for utilization by building technology teachers indicate that building technology teachers have preference for certain materials over others in the teaching and learning processes.

Instructional Materials

According to Ugwu (2017), instructional materials are devices, real objects, or representatives that teachers use to communicate effectively with the students. Instructional materials are those devices that must be there for the teacher to use while teaching to make the lesson more meaningful (Bagila, Kok, Zhumabaeva, et al., 2019). These include textbooks, comfortable seats, and well-ventilated classrooms. Instructional materials are most needed for the implementation of any educational program. They are inevitable because of the impact they have on teaching and learning programs and their processes. There is no doubting the fact that the essence of all techniques in teaching is to expose the learning to the subject matter. Unless adequate activities and materials are effectively employed, there is hardly a way the learners could be in contact with the subject matter. The use of instructional materials is recommended by many authors for effective teaching and learning at any stage of the child's development and level of education.

Segu-Essel (2021) opined that teachers are to employ instructional materials in their teaching in order to make sure that teaching is more permanent in the minds of the learners. Furthermore, instructional materials provide the learner with meaningful, accurate, and real experiences in learning. Instructional aides are what the teacher bri ngs to class to help the teacher impact the lesson with ease (Segu-Essel, 2021). Ugwu (2017) also stated that development in communication technology has made available new media that can be used in our educational practices to complement the traditional approaches. The media include; radios, audio cassettes, television videocassettes, slide and film strips projection, overhead and opaque projectors and computers.

Instructional material resources, according to Ugwu (2017), includes: laboratory equipment, textbooks, visual aids like computers and so on. These different categories of instructional materials are needed for the proper implementation of any educational programme.

Classification of Instructional Materials

There are varieties of materials for different level of educational system. The knowledge of a wide variety of instructional materials and the specific function they can perform is a value added advantage for the teacher. Therefore, care givers should Endeavour to source, provide, improvise and use as many instructional materials as possible.

The type of instructional materials depends on the sense they stimulate, their level of technology, projected or non-projected, print or non-print or to consider them generally as audio visuals materials. Instructional materials could be classified into six forms.

1. Audio - (deals with sound only): these include such things as radio, record players, cassettes, grammar phone, compact disc (CD) plates, songs and poems. These aid teaching through the sense of hearing and seeing.
2. Visual - (deals with sight.): the category of this consists of maps, film steps, specimen, pictures, charts and blackboard, positions. That category appeals to children through the sense of seeing.
3. Audio-visual - (combination of audio and visual i.e. sound and vision): These refer to things like television, films digital visual disc (DVD) and projectors, computers, IPADs etc. The use of these also aids learning greatly.
4. Print - (deals with hardcopies): This refers to things like books, newspaper, journals, handout etc. which the use aids effective learning.
5. Static/display: This refers to things like chalkboard, flannel graph, flip charts magnetic board.
6. Electronic: This refers to things like radio, computers etc.

III. Study Methodology

To investigate the availability, adequacy and currency of instructional materials and building equipment in Adamawa State of Nigeria technical colleges, the descriptive survey research design was used. Using a set of questionnaire, technical colleges in Adamawa State were visited, delivering questionnaire sets, which respondents responded to on the spot.

There are four technical colleges in Adamawa State, and two were purposively sampled for the study. The colleges are situated in Yola, the state capital, Numan, 80 km west. Mubi, 190 km north, and Michika, 300 km north east of the state capital, Yola. Government Technical College, Yola and Government Technical College Numan were purposefully sampled because of their proximity to the administrative seat of the state, and consequently

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lay within the open eyes of educational administrators, the situation which was assumed to attract better funding and attention.

All the 20 teachers found handling building technology lessons were involved in the study, thus, calling for no sampling of respondents, nor sampling technique. Consequently, the study relied upon data from 20 research participants for conclusions.

The questionnaire was the chief instrument of data collection. This was structured into three categories, A, building technology equipment plants and tools, B, modern instructional materials and C, traditional instructional materials. Building equipment plants, like building machinery and tools, like trowels, chisels and their like, fell under building equipment and tools, while computers, audio visual aids and symbolic graphic representations fell under modern instructional materials. The traditional instructional materials surveyed include pens, cardboards, scale rulers and written articles.

The collected data, being intended for a descriptive survey research, and bearing in mind that the study aimed at only determining the availability, adequacy and currency of the surveyed equipment and tools were subjected to percentage grading. Using this statistical tool, the availability of each equipment and tool was graded in percentage, and the relative percentage adequacy and currency of available materials were also such graded into percentage ratings.

IV. Data Presentation, Analysis and Interpretation

The study was conceived to assess the degree of availability and currency of building technology instructional materials in Adamawa State technical colleges. To achieve its target, the study adopted the use of questionnaire for data collection. The resulting data are here presented.

The questionnaire was structured into categories A, B and C. Each of the following plates summarizes the resulting data concerning a given category.

Plate 1: Building Equipment and Tools

S/N	Builders' tools	Number of builder's' tools available			
		1-5	6-10	11-15	16-20
1.	Concrete mixer	19 (95%)	01 (05%)	00 (0%)	00 (0%)
2.	Compacting Factor apparatus	19 (95%)	01 (05%)	00 (0%)	00 (0%)
3.	Compressive strength	19 (95%)	01 (05%)	00 (0%)	00 (0%)
4.	Testing machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
5.	Plan printing machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
6	Drilling machine	18 (90%)	02 (10%)	00 (0%)	00 (0%)
7.	Slump cone test apparatus	19 (95%)	01 (05%)	00 (0%)	00 (0%)
8.	Mechanical vibrators	19 (95%)	01 (05%)	00 (0%)	00 (0%)
9.	Soil hydrometer	19 (95%)	01 (05%)	00 (0%)	00 (0%)
10.	Vee-bee apparatus	19 (95%)	01 (05%)	00 (0%)	00 (0%)
11.	Atterm buberg limit	19 (95%)	01 (05%)	00 (0%)	00 (0%)
12.	Block making machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
13.	Concrete pumps machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
14.	Soil compactor machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
15.	Concrete cutter machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
16.	Earth rammer machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
17.	Hollow block making machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
18.	Tile making machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
19.	Bitument sprayer machine	19 (95%)	01 (05%)	00 (0%)	00 (0%)
20.	Screed board vibrator	19 (95%)	01 (05%)	00 (0%)	00 (0%)

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S/N	Builders' tools	Number of builder's' tools available			
		1-5	6-10	11-15	16-20
21.	Sand washing machine	19 (95%)	01 (5%)	00 (0%)	00 (0%)
22.	Asheld mixer machine	19 (95%)	01 (5%)	00 (0%)	00 (0%)
23.	Clay brick making machine	19 (95%)	01 (5%)	00 (0%)	00 (0%)
24.	Concrete molding machine	19 (95%)	01 (5%)	00 (0%)	00 (0%)
25.	Vibratory Rammer	19 (95%)	01 (5%)	00 (0%)	00 (0%)
26.	Terrazzo floor washing machine	19 (95%)	01 (5%)	00 (0%)	00 (0%)
27.	Surface plate vibrator	19 (95%)	01 (5%)	00 (0%)	00 (0%)
28.	Measuring tape	17 (85%)	02 (10%)	01 (5%)	00 (0%)
29.	Trowel	01 (5%)	02 (10%)	01 (5%)	16 (80%)
30.	Brick hammer	17 (85%)	03 (15%)	01 (5%)	00 (0%)
31.	Mason's square	17 (85%)	02 (10%)	00 (0%)	01 (5%)
32.	Chisels	01 (5%)	18 (90%)	01 (5%)	00 (0%)
33.	Wheelbarrows	18 (90%)	02 (10%)	00 (0%)	00 (0%)
34.	Tile cutters	17 (85%)	03 (15%)	00 (0%)	00 (0%)
35.	Putty knife	18 (90%)	02 (10%)	00 (0%)	00 (0%)
36.	Float	01 (05%)	18 (90%)	01 (5%)	00 (0%)
37.	Safety gloves	18 (90%)	02 (10%)	00 (0%)	00 (0%)
38.	Handsaw	17 (85%)	03 (15%)	00 (0%)	00 (0%)
39.	Head pan	17 (85%)	03 (15%)	00 (0%)	00 (0%)
40.	Hoe	17 (85%)	02 (10%)	00 (0%)	01 (5%)
41.	Ladder	19 (95%)	01 (5%)	00 (0%)	00 (0%)
42,	Pins	18 (90%)	02 (10%)	00 (0%)	00 (0%)
43.	Plumb bob	18 (90%)	02 (10%)	00 (0%)	00 (0%)
44.	Plumb rule	18 (90%)	02 (10%)	00 (0%)	00 (0%)
45.	Polisher	19 (95%)	01 (5%)	00 (0%)	00 (0%)
46.	Rubber boots	19 (95%)	01 (5%)	00 (0%)	00 (0%)
47.	Safety helmet	19 (95%)	01 (5%)	00 (0%)	00 (0%)

Plate 2: Modern Instructional Materials

S/N	Modern Instructional Materials	Level of availability		
		None	Inadequate	Adequate
1.	Internet connectivity	18 (90%)	01 (05%)	01 (05%)
2.	Computers, laptops and Projectors	03 (15%)	00 (0%)	17 (85%)
3.	Microcomputer resources (printers, scanners, educational software)	20 (100%)	00 (0%)	00 (0%)
4.	Interactive DVDs (educational songs, animated characters)	19 (95%)	00 (0%)	01 (05%)
5.	Audio-visual resources (films, videos)	19 (95%)	00 (0%)	01 (05%)
6.	Graphic organizers	19 (95%)	00 (0%)	01 (05%)
7.	Teacher-made resources (worksheets, hand-outs, projects)	01 (05%)	00 (0%)	19 (95%)
8.	Printed materials (textbooks, workbooks and other printed resources)	01 (05%)	01 (05%)	18 (90%)
9.	Symbolic and graphic representations (maps, charts)	02 (10%)	00 (0%)	18 (90%)

Plate 3: Traditional Instructional Materials

S/N	Traditional Instructional Materials	Level of availability		
		None	Inadequate	Adequate
1.	T-square	00 (0%)	17 (85%)	03 (15%)
2.	Parallel ruler	01 (05%)	17 (85%)	02 (10%)

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3.	Scale rule	01 (05%)	18 (90%)	01 (05%)
4.	Cardboard paper	02 (10%)	17 (85%)	01 (05%)
5.	Sketch pad	02 (10%)	17 (85%)	01 (05%)
6.	Pencils	03 (15%)	16 (80%)	01 (05%)
7.	Tracing papers	02 (10%)	18 (90%)	00 (0%)
8.	Pens	02 (10%)	18 (90%)	00 (0%)
9.	Textbooks	00 (0%)	20 (100%)	00 (0%)

V. Summary of Findings

a. Building equipment and tools are inadequate
b. Modern instructional technology equipment is inadequate
c. Traditional instructional equipment is relatively available, but not adequate
d. Rate of equipment improvisation by the teachers is abysmally low.

VI. Discussion of Findings

Instructional materials play crucial roles in achieving objectives of teaching sessions. Aderemi, Johnson and Cyril (2022), for instance, found instructional materials to impact on music lessons positively. As it specifically relates to building technology instructions, Umar, Ossom and Egbita (2020) found significant difference, as it relates to achievement of lesson objectives, between lessons taught with audio-visual aids, and those taught without. Moreover, other scholars, like Semeton (2023) dwelt in the relevance and mode of utilization of instructional materials, as well as the teachers improvisation skills in the absence or scarcity of instructional materials. The study found adequacy of instructional materials, and high level of teachers' improvisation skills to enhance learning building technology lessons. Bearing the foregoing in mind, this study investigated the level of availability and currency of building instructional materials in Adamawa State technical colleges.

Forty-seven building equipment plants and tools were assumed necessary in a building technology class; the level of existence of each of these in the studied colleges was investigated. The emerging result was that up to 30 of the assumed essential tools and plants were found to be either grossly inadequate, or completely absent at its worse. Most of these tools and building plants existed atbetween the range of 1 and 5 in these colleges; only trowel, the simplest and commonest was reported to exist at within the range of 16 and above. Even then, it was only 80% of the respondents that gave this report. This is against the study expectation that trowels should exist above the number of building technology students. The study noted that the average number of students per class in those colleges was 40. The readily question that would arise was how can, taking the maximum within the range, 40 students be taught with 5 building plants and tools? There is even that lowest range of 0 building equipment in some schools.

One surprising result was that 85% of the respondents reported that they have measuring tapes at the range of 1 – 5 pieces. Similarly concrete mixer was found to exist within the range of 1-5. This rate of equipment plants and tools is adjudged grossly inadequate to cater for 40 students at a time.

(See plate I above).

Investigation into modern instructional materials took internet connectivity, computer wares, interactive digital video discs (DVD's), symbolic graphs, and their likes as areas of focus. The emerged results were that only computers were reported by up to 80% to be adequate. Worse it was that the teachers harbored wrong self-concept; they reported adequate printed materials and graphics, yet, printers and designing machine were glaringly absent. Are these materials printed outside these colleges? If this is the case, this study concludes that these modern instructional materials are inadequate, and the existing ones are not current enough to be in tune with this age of science and technology.

The study anticipated internet connectivity, the modern principal instructional material, to be prominently available. Unfortunately, only 1% of the respondents saw internet connectivity as adequate in those colleges. Moreover, interactive digital video disc (DVD), another principal modern instructional technology facility was reported inadequate by up to 95% of the respondents. The study left wonders as to what modern instructional materials these teachers use, or are they solely relying on the traditional lecture method, where a teacher would stand before his students and deliver lectures to passive students?

(See Plate 2)

Investigation for traditional instructional materials focused on simple builders' tools like T-square, parallel ruler, scale rule, textbooks and their likes. The study found all these to be inadequate, in some cases, none. One wonders how simple builder's tools, like T-square and parallel ruler could be absent in the builders' tool kit. Where a tool is

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not existent during a class session, it is highly doubtful if the students will be able to utilize such a tool when they go onto the field. On the whole, building technology traditional instructional materials were found to be inadequate in the technical colleges in Adamawa State of Nigeria.

(See Plate 3).

VII. Summary and Conclusion

The study surveyed the existence, currency and adequacy of building technology instructional materials in technical colleges of Adamawa State, Nigeria. The materials were categorized into building equipment plants and tools, modern instructional materials, and traditional instructional materials. The study found a, relatively, high degree of adequacy of some modern instructional materials, chiefly the computers, but low degree of adequacy of both building equipment plants and tools, as well as the traditional instructional materials. Moreover, the fact that internet connectivity and digital video discs were virtually inadequate or at worse absent, reduces the impact of the utilization of instructional materials in these colleges.

Implication of Findings

The situation that building technology instructional materials are inadequate in building classes at these colleges' points that lessons cannot succeed there. Several studies tie teachers' success in the class to appropriate application of instructional materials (Adelemi, Johnson and Cyril, 2022; Umar, Ossom and Egbita, 2020; Semeton, 2023).

VIII. Recommendations

Having observed that the situation regarding instructional materials is bad in the state, this study offers the following recommendations.

a). Teachers of building technology must imbibe the attitude of improvisation
b). Parents should come to the aid of the school proprietors in the procurement of building tools
c). The public should draw the attention of the Nigerian government to the relevance of instructional materials in school
d). Further studies to authenticate the actual instructional materials teachers of building technology use at the study area should be undertaken
e). This study should be replicated using students as respondents, instead of teachers.

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