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Article

Attaining standards in technology education in Nigeria universities through effective utilization of physical facilities

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Technical Education programmes at university level involve an effective interaction among the lecturer, the student and the environment. The environment which includes the physical facilities enables the lecturer to attain cognitive, affective, and psychomotor domain objectives. These traits could only be attained if the lecturer adopts instructional approaches that effectively associate with the use of physical facilities. However, doubts have been raised over the adequacy and effective utilization of physical facilities for the attainment of these educational objectives. This study therefore was designed to determine the level of availability of physical facilities, their utilization and what instructional approaches, given available physical facilities, would be suitable for the attainment of educational objectives in the programmes of Technical Education. To carry out the study, three hypotheses were formulated. An instrument containing 213 items was developed and used to obtain data from a population of 40 lecturers in three universities offering Technical Education programmes in Edo and Delta states of Nigeria. Frequency count, mean, percentage and National Universities Commission standard requirements were used to answer hypothses 1&2, while the analysis of variance (ANOVA) was used in testing hypotheses 3, at 0.05 level of significance. The findings revealed among other things that physical facilities are inadequately provided for instructional purposes as only 22 physical facility items (24%) out of the 161 presented in the list were found in adequate quantity in these universities. Physical facilities were also rarely utilized as only 77, representing 48% of the 161 physical facility items were often utilized for instructional purpose. Based on these findings, recommendations were made for universities to provide and effectively utilize physical facilities, as well as adopt the listed instructional approaches for the attainment of the domains of educational objectives. Suggestions were also made for further studies on the utilization of physical facilities for the attainment of education objectives.

Key words: Standard attainment, technology education, facility utilization.

INTRODUCTION

Technical education programme in Nigeria Universities are concerned with equipping persons with skills, knowledge and attitude that will enable one to enter into, and progress as lecturers and instructions in their chosen areas of course specialization. This will enable the attainment of objectives in the cognitive, affective and psychomotor domains of educational objectives. Teaching and learning in technical Education programmes according to Saran (2000) requires a close interactive process between the instructor and the learner, which results in the learner gaining knowledge, technical information and skills. Training also requires the attainment of objectives in the cognitive affective and psychomotor domain of educational objectives. It therefore, becomes necessary that the student-teachers should posses strong interest in a course area, ability in manipulative skills, and an innate aptitude in the field of teaching. On the other hand the instructor of Technical Education among other qualities should have a good knowledge of the course area, should be able to teach and should be sympathetic to the learning needs of the students.

Technical education according to Saran (2000), offers

Building Construction/woodwork, applied Electricity/ Electronic and Metal/Automechanics as main course areas. Physical facilities are the essential concrete features that assist or enable the teacher teach effectively and could also be classified as tools. In Nigeria Tools in industrial technical education are grouped together according to National Universities Commission, NUC (2004) and they include saws, pliers, files, chisel, screws drivers, etc., and they are classified as hand tools. The lathe, pillar drills, grinders, power saw, combination planners, rolling, shaping and milling machines are classified under machine tools, while some materials include steel rods, wood and cement. Facilities common to the course areas of technical education are: storage places for materials, first aids box demonstration charts, wash-hand basins, electrical sockets, drawing and chalk-boards, and the main workshop building.

Planning for physical in technical education for an effective attainment of educational objectives consideration to the number of students that should enroll in the programme also, retaining the good and serviceable condition of physical facilities requires a good maintenance culture. Additionally, in order to effectively attain the affective domain, good and serviceable physical facilities, according to saran (2000) help to cerate sanity in relationship between the teacher and students. It is also important to explain that the existence of physical facilities in required number does not in itself achieve the instructional objectives. Rather, physical facilities should be effectively associated with appropriate instructional approach in order to achieve stated instructional objective.

The Utilization of instructional materials to the methodology and practice of technical education

Dewey (1962), an American philosopher strongly believed in the role of learning by doing. Experience counts very much. A subject is learned when certain process have been gone through. Many teachers think that when they have shown their pupil how to apply certain principles and generalization, they have achieved as much as possible, this might be true with some children ability in these cognitive skills. For example, of a teacher takes different sides circular objects some strips of types ruler and razor blade in to the classroom he can ask the children to make use of the materials provided to find out the relationship between the radius and the circumference of the children must be able to analyze synthesis and evaluate whenever they are given the same problem with aids.

Another view of another author an educationalist on the utilization of instructional materials play a very big role in making the teaching of any subject more effective. Instructional materials are important in teaching just as magic cubes, tomatoes and other ingredients are important to a good meal. The correct use of instructional materials often gives correct representation to the abstract ideas thereby making their meaning clever and pleasant. It serves as a useful purpose in promoting understanding to concept and principles.

Physical facilities and instructional approaches in technical education

Physical facilities in industrial technical education are the essential concrete features that enable the instructor teach effectively in the industrial technical education workshop and classrooms (Okoro, 1991; Oranu, 1994) physical facilities which includes the building, machines, workbenches, equipment, tools and materials form a major place and resources which the instructor manipulates in other to cause learning to occur. This implies that physical facilities are those items which the teacher turns to for help in his goal of seeking activities that would help him perform the job of instruction. In addition, whatever the teacher uses as aid in order to teach a lesson could be referred to as facilities. Also, Larson (2007) emphasized that the school building could be referred to as physical facility because of its function of housing and protecting other physical facilities inside it.

Design and construction of the technical workshop building and effectiveness in technical instruction cannot be fully effective when adequate provision is not made for other physical facilities contained in the building. Writing, Wang (2003) submitted that these physical facilities are instructional materials like charts, chalkboards, sample objects and specimen, tools, equipment and machines which are used in making teaching meaningful. He added that physical facilities help the teacher convey intended massages effectively so that the learner receives, understands, retains and applied experience gained to reach overall educational goals. In listing of physical facilities, Okoro (2004) have the following essential tools and equipment of the school workshop. Work bench, Engineers' vice. Hacksaw frames, various grades of hand files, drill bits, Engineers; pliers, chisel, try square tools enter punches, scribers, scrapers, metric tape, stock and dies, screwdriver etc. These tools and equipment help actualize instructions of technical education curriculum.

According to Olaitan (2002) arrangement of the workshop, good safety precautionary measures and nice aesthetic outlook are principles that could aid the technical department in planning, organizing and managing facilities and equipment. Also contributing, Sylvinus and Curry (1967) listed six factors that should be put into consideration while constructing a workshop for technical education and for remodeling old ones. They are:

i.) Consideration for aims and objectives of the course to be taught must be useful to the locality and have a relevant philosophical base.
ii.) The use of units makes the content of courses to be offered as a guide for providing hand tools and other equipment.
iii.) Method and approach should govern the placement of

equipment; also the limited general shop shall call for a different arrangement to that used for multipurpose type.
iv.) The number of students that will be scheduled in the shop at any given time must be considered.
v.) Age and mental capacity of students will affect the size of the workshop and equipment.
vi.) The resources available must be considered. The type of equipment and the expenditure for it must coincide with the money available for the programme.

These recommendations support the idea that the construction of a new workshop or remodeling of an existing one will involve a thorough analysis of the course, the students need for the programme and ways of reaching reasonable competence in manipulative skills.

Acquiring competence in skill training is one of the most essential activities of the school workshop. Equipping a workshop with adequate activities remained paramount in the contributions of Aina and Beecroft (1982). This provision could be accomplished through compliance to various recommendations by organizations that create standards. The Nigerian universities commission (1992) recommended a specified number of each of the tools, equipment and machinery for a specified number of students intended for admission in an academic year for Engineering and industrial technical education programme in universities. This recommendation by the NUC means that such facilities should be given consideration in the initial planning of the course programme. The NUC also emphasized that a provision of these facilities less than the number specified in any o the universities Nigeria would be classified as inadequate. Contributing, Agusiobo (1986), Ezeji (1984), Olaitan (1994) and Oranu, (1994) recommended proper planning which will give early consideration to the provision of tools and equipment. This provide mean that the entire process of planning a course programme will include at what stages, who and when these facilities are going to be employed.

Non-use of adequate planning and physical facilities in the technical educational workshop could be comparable to the informal type of trade and skill training the Ugonabo and Ogwo (2006) referred to as lacking in structure and organization terms of context, methodology and mode of evaluation for mastery. As a possible solution they called for the need for an organized and effective method of training that will develop the vocational education system. Considering this call for the use of adequate and functional physical facilities, Prosser and Quigley (1949) in Okoro (2003) presented a number of principles which they developed that had substantial influence on the administration of vocational education. These principles which Okoro said are still useful till date today specified that there are minimum standards below which effective vocational education cannot be offered.

Purpose of the study

The purpose of this study is to identify which physical facilities are available for use in the programme of technical education, how often they are utilized, and how they could be used with instructional approaches for the attainment of education objectives of technical education programme. Specifically, this study identified;

i.) What physical facilities are available for instructional purpose in technical education programmes in Nigerian Universities?
ii.) The frequency of utilization of the available physical facilities for the attainment of educational objectives in technical education programme in Nigeria Universities.

Significance of the study

The study on the instructional approaches for the attainment of educational objectives in technical education programmes in Nigerian Universities is significant because the National Universities Commission (NUC) shall benefit from the study. The study will state what physical facilities are available in the universities as well as indicate how often they are utilized for instructional purposes. The accreditation panel of the NUC shall through the findings determine which areas it could recommend to the universities of improvement.

Deans of faculty and heads of department will also use findings of this study to suggest an improvement for physical facilities and instructional approaches in industrial technical education. Deans of faculty and Head of departments will relay ands subsequently enforce the findings for use in the workshops and lecture rooms for maximum output. Also to be provided in this study to the deans and the head of the department are instructional approached that lead towards the attainment of specific objectives. This will help to ensure that the graduates acquire a level of training which will enable them teach effectively or graduation.

Lecturers and instructor of technical education will also benefit from the findings and recommendations of the study. They will by the findings apply effective instructtional approached that will enable them achieve a high level of instructional effectiveness. They would apply and combine these qualities, characteristics and attributes of a cognitive, affective and a psychomotor teacher in order to realize stated objective.

Hypotheses

$H0_1$: There is no significant difference in the mean scores of the lecturers in the three major course areas on the physical facilities available for instructional purposes and the recommended NUC facilities for the teaching and learning of technical education in Nigerian Universities ($p < 0.5$).

$H0_2$: There is no significant difference in the mean scores of the lecturers in the three major course areas on the

Table 1. Universities offering Technical Education programme in Edo and Delta states.

S/No.	Name of university	Course areas			
		Building/Wood work	Electrical/ Electronics	Metal/ Auto	Total
1	University of Benin, Benin City	5	4	6	15
2	Ambrose Alli University, Ekpoma	6	3	3	12
3	Delta State University, Abraka	4	5	4	13
	Total No. of Lecturers	15	12	13	40

Method of data analysis.

frequency of utilization of available physical facilities for the teaching and learning of technical education in Nigerian Universities ($p < 0.5$).

$H0_3$: There is no significant difference between the mean score of the lecturers in the three major course areas on the instructional approaches that will be suited for the use of the physical facilities for the attainment of the cognitive, affective and psychomotor domain educational objectives of industrial technical education programme ($P < 0.5$).

RESEARCH DESIGN

The design for this study is a descriptive survey. According to Borg and Gall (1993) the design is the one which a group of people or items considered to be representative of the entire group. The study involved the use of structured questionnaire to elicit information from lecturers in technical education departments of specified Nigerian Universities. Results and recommendations were arrived at through a systematic description of data collected by the use of a structured questionnaire.

Area of study

This study was carried out within the three public Universities offering Technical Education in Edo and Delta states of the South-South zone of Nigeria. Details of these universities are shown in Table 1.

The data were analysed using both descriptive and inferential statistics. The study has three hypotheses that were analysed as follows:

i.) Frequency count, mean, percentage and NUC standard requirements were used for analyzing hypothese 1.
ii.) Mean was used for hypotheses 2.
iii.) The analysis of variance (ANOVA) statistics was used to test hypotheses 3 at 0.05 level of significance.

Presentation and analysis of data

This section deals with the presentation and analysis of data with respect to the hypotheses formulated for this study.

$H0_1$: There is no significant difference in the mean scores of the lecturers in the three major course areas on the physical facilities available for instructional purposes and the recommended NUC facilities for the teaching and learning of technical education in Nigerian Universities ($p < 0.5$).

To test hypotheses 1, a list of 161 physical facility items were presented in the instrument for the head of course programmes to indicate the number of physical facilities available for instructional purposes. The numbers of physical facilities indicated by them are then compared with the number recommended by the Nigerian Universities Commission (NUC) as prerequisite for the course programme accreditation. Data collected are presented in Tables 2, 3, 4, and 5. Tables 2, 4 and 5 contain ratings according to course areas, the level of adequacy and inadequacy of physical facility items existing in the universities, while Table 7 contain summary of the data collected on the adequacy level of physical facility items.

The result in table 2 shows that no institution under study has all the 41 physical facility aims at 100% adequacy level. Rather in order of ranking, Benin has the highest items of 25 representing 61% AAU has 23 items at adequate quality, Delta state university lie at the lowest with 19 items adequate, representing 46% of the 41 physical facility items listed.

Data I table 3 shows that only 3 physical facility items out of the 60 items listed were found in adequate quantity in all the institutions under study. This represents 5%. In ranking the 3 institutions, DELSU has the highest with 37 items adequate, representing 62% items. Benin 31 items, and lastly is AAU with 29 physical facility items adequate, representing 48% of the 60 items presented.

Data presented in table 4 shows that only 19 physical facility items were found in adequate quantity in the 3 institutions under study. 41 other items out of the 61 items listed were in inadequate quantity. In the adequacy level of various institutions studied, Benin has the highest number of adequate items with a frequency of 47 items, representing 61%, AAU 42 items, DELSU 39 items, representing 43%.

Table 2. Existing physical facilities in applied electricity/electronics course programme.

S/No.	Tools, Equipment and Machines	NUC Min	BENIN	AAU	DELSU	% ADEQT
1	Universal pipe bending	3	3	3	2	50
2	Long nose pliers	10	20	13	16	87.5
3	Blow lamps	6	3	12	4	37.5
4	Hammers assorted sizes	15	15	15	16	75
5	Hand drill	3	4	4	8	87.5
6	Cold chisel sets	10	11	16	8	37.5
7	Screw driver	20	32	24	18	75
8	Electronic soldering iron 15/48w assorted	15	18	22	17	87.5
9	Files assorted	20	20	16	28	50
10	Wire gauze	5	4	2	8	37.5
11	Screw driver	20	14	27	31	75
12	Measuring tapes	20	30	18	28	87.5
13	Metal rectifiers	20	22	18	13	37.5
14	Fixtures-fluorescent	10	11	6	8	75
15	Capacitors assorted	20	25	18	33	87.5
16	Bells electric	10	7	15	6	25
17	Hydrometer	10	8	15	12	87.5
18	Magnetic kit	10	7	16	4	50
19	Continuity tester	10	8	14	8	25
20	Motor-wound motor induction	5	6	4	3	37.5
21	Miniature circuit breakers	10	12	13	7	37.5
22	Potentiometer	10	12	8	17	75
23	Motor generator unit – 220v	10	11	18	4	62.5
24	Power supply	5	6	5	1	37.5
25	AC and DC motor	15	14	11	22	62.5
27	Vacuum tube voltmeter	10	7	2	3	00
28	Voltmeter dc 0-2.5-25-220v	10	8	4	13	50
29	Experimental cell	1	-	2	-	50
30	Switches assorted	15	17	10	8	75
31	Relays	10	15	10	12	75
32	Volt-ohm meter, 240-500v	10	15	3	7	37.5
34	Cathode ray oscilloscope	4	3	2	3	50
35	Ammeter d. e 0-54 scale	10	12	11	13	37.5
36	Bench radio	4	2	1	2	37.5
37	Watt-hour meter (PHCN)meter	10	17	3	8	50
38	Work benches	15	18	20	22	75
39	Galvanometer	10	11	18	13	87.5
40	Generator (sine and wave)	6	7	5	6	87.5
41	Frequency modulator	2	1	1	3	75
42	Cathode ray tubes	5	4	8	2	62.5
	Total No. of items		25	23	19	
	% Adequate		61%	56%	46%	

NUC Min: minimum number of physical facilities recommended by the National Universities commission (NUC)
%ADEQT: Percentage of the 3 universities with the minimum number of physical facilities in adequate quantity.

Data in table 5 revealed that BENIN, has the highest number of physical facilities of 103 items, representing 64%, DELSU has 98 items in adequate quantity with 61% and lastly AAU with 91 physical facility items with 57% adequacy level.

$H0_2$: There is no significant difference in the mean scores of the lecturers in the three major course areas on the frequency of utilization of available physical facilities for the teaching and learning of technical education in Nigerian Universities ($p < 0.5$).

Table 3. Existing physical facilities in Building Construction/woodwork course area.

S/No.	Tools, Equipment and Machines	NUC Min	BENIN	AAU	DELSU	% ADEQT
1	Portable tools (assort)	50	62	81	62	100
2	Pipe wrenches(assort)	5	7	2	5	50
3	Port compressor and acc	2	1	3	1	75
4	Portable concrete mixer	2	2	1	2	87.5
5	Portable pipe thread	2	2	3	1	75
6	Hack saws	15	15	15	11	50
7	Block making mach	2	1	2	-	37.5
8	Spades	10	10	14	3	37.5
9	Chisels	10	8	10	4	50
10	Trowels (assorted)	20	18	14	15	25
11	Tape measure (2.6 m)	15	15	10	18	50
12	Head pans	10	8	4	11	37.5
13	Sprit levels	15	20	14	16	50
14	Lion square	15	10	16	1	37.5
15	Shovels	10	6	12	4	25
16	Jack planes	15	16	10	18	75
17	Smoothing planes	15	16	15	15	75
18	Rebate planes	15	12	11	18	75
19	Grooving/plough planes	3	3	2	5	50
20	Compass plane	3	1	3	2	12.5
21	Rip saw	15	15	2	15	25
22	Crosscut handsaw	15	13	10	4	50
23	Tension saw	15	15	12	17	37.5
24	Coping saw	15	10	15	13	37.5
25	Compass saw	10	9	4	10	50
26	Key hole saw	10	4	2	10	37.5
27	Fret saw	10	10	11	6	50
28	Panel saw	10	10	4	8	50
29	Formal chose;	20	10	24	8	25
30	Revenge chisel	20	26	12	24	37.5
31	Notice chisel	10	14	8	16	50
32	Firmer gauge set	8	2	10	4	37.5
33	Auger set	13	10	8	13	75
34	Twist set	10	14	11	11	75
35	Gimlet set	10	17	10	11	75
36	Spoke shaves set	10	9	12	3	37.5
37	Screw driver set	10	4	8	7	37.5
38	Mallet	16	15	12	17	50
39	Claw hammer	10	8	12	8	37.5
40	Bradawls;	10	6	6	12	25
41	Sash cramp	10	8	4	3	25
42	G –Clamp	8	6	5	10	12.5
43	Circular saw	3	2	4	2	25
44	Surface	1	3	2	1	100
45	Wood lathe assoc	1	1	2	1	100
46	Band saw	1	4	2	1	87.5
47	Moister	1	1	-	-	75
48	Sanders	1	1	-	1	75
49	Cross cur sawing machine	1	1	2	1	87.5
50	Drilling machine	1	1	-	1	75
51	Oil cans	6	7	3	6	62.5

Table 3. contd

52	Sewing machine	2	1	2	3	62.5
53	Try square	10	12	14	12	87.5
54	Staples	5	-	3	5	37.5
55	Marking gauges	10	10	13	17	87.5
56	Mortise gauges	8	6	11	10	75
57	Marking knives	8	14	4	12	62.5
58	Meter square	8	14	4	18	62.5
59	Measuring tape	10	6	13	4	62.5
60	Compressor	3	2	1	4	25
	Total No of Items		31	29	37	
	%Adequate		52%	50%	62%	54.38%

NUC Min. Minimum number of physical facilities recommended by the National universities commission (NUC).
% ADEQT. Percentage of the 8 universities that the minimum number of the physical I adequate quantity.

Table 4. Existing physical facilities in metal work/auto mechanic course programme.

S/No.	Tools, Equipment and Machines	NUC Min	BENIN	AAU	DELSU	% ADEQT
1	Set of taps and wrench	10	13	11	12	87.5
2	Hacksaw frames	20	10	15	21	50
3	Cold chisels	15	13	16	21	37.5
4	Files assorted	20	10	27	15	50
5	Steel rule (300m)	20	27	10	16	50
6	Scriber	15	15	16	10	37.5
7	Set of dies and stock	10	18	8	14	50
8	Venier calipers	10	5	2	11	37.5
9	Micrometer assorted	20	8	4	14	25
10	Hammers	10	12	12	22	100
11	Metal scrapers	13	15	18	10	50
12	Try square	11	18	11	13	75
13	Sanding machine	1	4	1	6	100
14	Grinding machine (uni)	1	3	1	2	100
15	Power hacksaw	1	1	1	-	75
16	Benches vices	18	20	10	24	87.5
17	Centre lathe	5	2	4	8	37.5
18	Grinding wheels	10	7	8	6	25
19	Pillar drilling machine	2	2	3	1	75
20	Milling cutters assorted	10	18	16	8	75
21	Universal milling Mac.	1	1	1	1	100
22	Surface plates	2	2	3	2	75
23	Forging hammers	10	11	16	8	50
24	Blows lamps	4	5	7	4	100
25	Soldering bits	20	24	21	15	50
26	Anvil	2	2	3	4	100
27	Blacksmith hearth	1	1	-	1	87.5
28	Flat nose pliers	15	16	4	16	50
29	Furnace for heat treat	2	2	2	2	75
30	Pipe cutter	2	2	1	1	37.5

Table 4. contd

31	Punches	15	17	8	18	75
32	Life vehicle	1	1	1	-	50
33	Dead vehicle	1	1	-	-	50
34	Diesel vehicle	1	2	-	-	25
35	Petrol engine	1	-	-	-	25
36	Chassis	1	-	1	-	25
37	Spanners open ended	10	12	16	11	100
38	Ring spanners	10	13	10	18	100
39	Socket spanners (boxes)	6	8	8	10	100
40	Ball peen	10	18	14	6	75
41	Pullers assorted	6	6	5	4	37.5
42	Grease guns	6	2	4	6	37.5
43	Screw driver assorted	10	12	10	10	87.5
44	Pliers assorted	20	33	15	24	87.5
45	Chisel assorted	20	23	30	21	100
46	Files assorted	15	15	18	30	100
47	Engineers square	10	12	18	8	50
48	Allen keys	10	12	21	18	100
49	Twist drills	10	10	16	13	100
50	Tread cutting taps and dies	5	2	5	2	50
51	Rubber mallets	5	8	8	7	100
52	Tire levers	5	6	2	6	50
53	Air compressor	1	4	2	1	100
54	Battery charger	1	3	1	2	100
55	Welding equipment	1	2	2	1	100
56	Electric soldering	10	11	8	10	87.5
57	Soldering lead	10	12	18	17	100
58	Grinding machine	1	2	1	1	100
59	Wheel balancing machine	1	1	-	-	50
60	Wheel alignments machine	1	-	-	1	50
	Total No of Items		47	39	42	
	% Adequate	75%	61%	43%	52%	68.50%

NUC Min: Minimum number of physical facilities recommended by the National universities commission (NUC).
% ADEQT: Percentage of the 3 universities with the minimum of physical facilities in adequate quantity.

Table 5. Availability of workshop facilities in the various Universities.

Name of university	Applied Elec./Electronics			Building/woodwork			Metal Auto-mech			Summary of availability in the 3 courses		
	Ad	%	Rank	Adq.	%	Rank	Adq.	%	Rank	Adq.	% Adq.	Rank
AAU (Ekpoma)	23	56	2nd	29	50	3rd	39	43	3rd	91	57	3rd
DELSU (Abraka)	19	46	3rd	37	62	1st	42	52	2nd	98	61	2nd
UNIBEN (Benin)	25	61	1st	31	52	2nd	47	61	1st	103	64	1st
		56.2			54.4			68.5			60.1	

To answer hypotheses 2, industrial technical education lecture responded to items that requested them to indicate the rate level of utilization of physical facility items in the course of instruction. Data collected for this research question are presented in Tables 6, 7, 8 and 9.

Table 6 indicates the level of utilization of the physical

facilities for the attainment of education objectives by the lectures of applied electricity/electronics course programmme.

The table shows that 24 items are often utilized for instructional purposes because they have a mean of up to 3.5 and above. While item with mean score below 3.5 are rarely utilized. A grand mean (x) score of 3.40 has also shown that physical facilities are generally rarely utilized for the attainment of educational objectives in the course area of applied electricity/electronics.

Data presented in table 7 shows that of the 60 physical facility items, 27 obtained a means response of 3.5 and above, therefore often utilized, while 33 other items with a mean score below 3.50 were rarely utilized in the course area of building construction/woodwork.

Data presented in table 8 shows that 26 items scored a mean utilization rate of above 3.50, while 34 items obtained a mean score lower than 3.50. A grand mean score (x) of 3.01 is also an indication of rare utilization level for the physical facilities existing in the course area of metal/ automechanics.

The summary of level of utilization of physical facilities in the three course areas is shown in table 9. Data revealed that only 77 physical facility items out of the 161 listed are often used for the attainment of educational objectives of technical education, representing 49% of the all the facilities presented. 84 physical facility items are rarely utilized for the attainment of educational objectives, representing 51% of the total listed.

$H0_3$: There is no significant difference between the mean score of the lecturers in the three major course areas on the instructional approaches that will be suited for the use of the physical facilities for the attainment of the cognitive, affective and psychomotor domain educational objectives of industrial technical education programme ($P < 0.5$).

The data analyzed for the null hypothesis above are presented in Table 10, analysis of variance (ANOVA) was used to determine whether or no there were significant difference in the mean scores of lecturers of applied Electricity/Electronics, Building Construction/woodwork and Metalwork/automechanics on the instructional approaches suitable for the use of the physical facilities for the attainment of the cognitive, affective and psychomotor domains educational objectives of technical education. The ANOVA was used at 0.05 level of significance.

In the data presented in table 10, the obtained F-ratio is 0.70 while the given critical value is 3.19 at the 0.05 level of significance.

Since the obtained F-ratio of 0.07 is less than the critical value of 3.19 at the 0.05 level of significance, the hypothesis is hereby accepted. The F-ratio is therefore not significant. There is no significant difference in the mean scores of the three groups of lecturers on the instructional approaches that will be suitable for the attainment of the cognitive domain educational objectives of technical education.

PRINCIPAL FINDINGS

The following are principal the findings of this study.

i.) The result of the study revealed that physical facilities are inadequate in the course area of applied electricity/ electronics. Detail showed that none of the institutions provided all the listed 41 physical facility items at 100% adequacy. Also no item was found in adequate quantity in the 3 universities under study.

ii.) In the course area of building construction/woodwork, only 3 physical facility items were found in adequate quantity in the universities under study. Also, none of the universities has all the items adequate or as recommended by the Nigerian universes commission.

iii.) Physical facilities provided in the course area of metalwork/auto mechanic are inadequate. Out of the 60 items presented only 19 were found in adequate quantity in all the universities, representing 37% adequacy level. Also, no university also has the physical facilities at a 100% adequate level, as recommended by the NUC.

iv.) The summary of the existing physical facilities revealed that only 32 physical facilities could be obtained at all in all the universities under study, out of the 161 items listed. This represents 24% and a high inadequacy level of 76%.

v.) In the course area of Applied Electricity/Electronics 24 physical facility items are often utilized for the attainment of educational objectives, representing 59% of the list of the 41 physical facility items presented to the respondents. 17 items representing 41% are rarely utilized for instructional purposes.

vi.) In the course area of building construction/woodwork, 27 items, representing 45% of the physical facilities are often utilized for instructional purposes. On the other hand 33 other items representing 55% of the total number are rarely utilized for the attainment of educational objectives of industrial technical education.

vii.) The result of the course area of metal work/automechanic shows that only 26 physical facility items, representing 43% of the total 60 items presented were often utilized for the attainment of educational objectives. 34 others representing more than half of the total number are being rarely utilized for the attainment of educational objectives.

viii.) There is no significant difference in the mean scores of the lecturers of the three different course areas of applied electricity/electronics, building constructions/ woodwork and the lecturers in the course metalwork/ aeromechanics on the instructional approaches suitable with the use of the physical facilities for the attainment of the affective domain educational objectives of technical education.

ix.) In the area of the psychomotor domain, students could suitably be taught to perceive with their sensory

Table 6. Rate of utilization of physical facilities in Applied Electricity/Electronics course programme.

S/No	Tools, Equipment and Machines	X (mean)	Rate of use
1	Universal pipe bending	3.64	Often
2	Long nose pliers	4.46	Often
3	Blow lamps	2.40	Rarely
4	Hammers assorted sizes	4.06	Often
5	Hand drill (electric)	4.30	Often
6	Cold chisel sets	4.43	Often
7	Screw driver (general purpose)	4.43	Often
8	Electric soldering iron 15/48w assorted	4.28	Often
9	Files assorted	2.78	Rarely
10	Wire gauze	3.53	Often
11	Screw driver (electricians	4.46	Often
12	Measuring tapes (steel) 6m	4.37	Often
13	Metal rectifiers	2.68	Rarely
14	Fixtures-fluorescent	2.62	Rarely
15	Capacitors assorted	3.53	Often
16	Bells electric	2.36	Rarely
17	Hydrometer	4.25	Often
18	Magnetic experiment and demonstrating unit	3.40	Rarely
19	Continuity tester	4.18	Often
20	Motor-wound motor induction	2.50	Rarely
21	Miniature circuit breakers	2.75	Rarely
22	Potentiometer	4.18	Often
23	Motor generator unit – 230v	3.60	Often
24	Power supply – electric circuit with meters for filament B and C suppliers	3.78	Often
25	Motor AC and DC demonstrations for generator and motor	4.30	Often
26	Oscilloscope (kit/form)	3.30	Rarely
27	Vacuum tube voltmeter it form	4.09	Often
28	Voltmeter DC 0-2.5-25-250-750	3.15	Rarely
29	Experimental cell	4.46	Often
30	Switches assorted	4.28	Often
31	Relays	4.30	Often
32	Volt-ohm millimetre, 20,000 ohms-volt	1.65	Rarely
33	Cathode ray oscilloscope	3.06	Rarely
34	Ammeter DC 0-54 scale	1.78	Rarely
35	Bench radio works with instrument 230 volts outlet 2.75	2.75	Rarely
36	Watt-hour meter (PHCN) meter	3.53	Often
37	Work benches	4.30	Often
38	Galvanometer	3.93	Often
39	Generator (sine and wave)	4.34	Often
40	Frequency modulator	1.56	Rarely
41	Cathode ray tubes	2.53	Rarely
	Grand mean	3.40	Rarely

X – Mean response of items: Often-Often Utilized: Rarely- Rarely Utilized.

organs through guiding them to recognize clues, make choices and translate into action by correctly operating machines and equipment.

x.) A summary of the instructional approaches shows that out of the instructional approaches listed for the attainment of educational objectives, in the cognitive,
affective and the psychomotor domain were rated as suitable for the attainment of the educational objectives of technical education programmes.

Conclusion

Based on the results, discussions and findings of this

Table 7. Rate of utilization of physical facilities in building construction /woodwork course programme.

S/No	Tools, Equipment and Machines	X	Rate of use
1	Portable tools assorted	4.38	Often
2	Pipe wrenches assorted	1.75	RU
3	Portable compressor and accessories	4.08	Often
4	Portable concrete mixer	4.44	Often
5	Portable pipe thread	4.16	Often
6	Hacksaws	1.55	Rarely
7	Block/brick making machine	1.80	Rarely
8	Spades	1.69	Rarely
9	Chisels	1.88	Rarely
10	Trowels (assorted)	1.86	Rarely
11	Tape measure (2.6m)	1.77	Rarely
12	Head pans	1.86	Rarely
13	Spirit level	2.66	Rarely
14	Iron square	2.60	Rarely
15	Shovels	1.90	Rarely
16	Jack planes	4.19	Often
17	Smoothing planes	4.25	Often
18	Rebate planes	4.11	Often
19	Grooving/plough planes	2.90	Rarely
20	Compass plane	2.38	Rarely
21	Rip saw	2.25	Rarely
22	Cross cut/hand saw	2.69	Rarely
23	Tenon saw	4.19	Often
24	Coping saw	4.25	Often
25	Compass saw	4.27	Rarely
26	Keyhole saw	1.90	Rarely
27	Fret saw	2.02	Rarely
28	Panel saw	2.90	Rarely
29	Firmer chisel	2.08	Rarely
30	Bevel-edge chisel	3.00	Rarely
31	Mortise chisel	2.56	Rarely
32	Filler gauge (set)	1.90	Rarely
33	Auger (set)	4.00	Often
34	Twist (set)	4.05	Often
35	Gimlet (set)	4.22	Often
36	Spoke shaves (set)	1.58	Rarely
37	Screw driver (set of 6)	2.05	Rarely
38	Mallet	2.60	Rarely
39	Claw hammer	2.05	Rarely
40	Bradawl	2.86	Rarely
41	Sash cramp	1.88	Rarely
42	G-Cramp	1.69	Rarely
43	Circular saw	2.75	Rarely
44	Surfacer	4.47	Often
45	Wood lathe with accessories	4.25	Often
46	Band saw	4.19	Often
47	Motiser	4.13	Often
48	Sanders, drum, disc and bell	4.11	Often
49	Cross cut sawing machine	4.11	Often
50	Drilling machine	4.22	Often

Table 7. Contd.

51	Oil cans	4.30	Often
52	Sewing machine	2.83	Rarely
53	Try square	4.19	Often
54	Staples	2.77	Rarely
55	Marking gauges	2.22	Rarely
56	Mortise gauges	4.27	Often
57	Marking knives	4.25	Often
58	Meter square	4.13	Often
59	Measuring tapes (metric) 6m	4.19	Often
60	Compressors	4.08	Often
	Grand mean	3.12	Rarely

X- Mean response of items; Often-Often Utilized; Rarely- Rarely Utilized.

Table 8. Utilization of physical facilities of metal work/automechanics course programme.

S/No	Tools, Equipment & Machines	X	Rate of use
1	Set of taps and wrench	4.35	Often
2	Hacksaw frames	4.47	Often
3	Cold chisels	1.50	Rarely
4	Files assorted	4.14	Often
5	Steel rule (300m)	4.29	Often
6	Scriber	1.60	Rarely
7	Set of dies and stock	1.5	Rarely
8	Vernier calipers	4.35	Often
9	Micrometer Assorted	1.55	Rarely
10	Hammers	4.52	Often
11	Metal scrapers	1.76	Rarely
12	Try square	4.40	Often
13	Sanding machine	2.29	Rarely
14	Universal cylindrical grinding machine	1.60	Rarely
15	Power hacksaw	1.58	Rarely
16	Benches vices	4.47	Often
17	Centre lathe with accessories	1.47	Rarely
18	Grinding wheels (assorted)	1.60	Rarely
19	Pillar drilling machine with accessories	1.94	Rarely
20	Milling cutters assorted	1.55	Rarely
21	Universal milling machine	4.58	Often
22	Surface plates	1.60	Rarely
23	Forging hammers assorted	1.85	Rarely
24	Blow lamps	4.38	Often
25	Soldering bits	1.73	Rarely
26	Anvil	4.38	Often
27	Blacksmith hearth	1.76	Rarely
28	Flat nose pliers	1.76	Rarely
29	Furnace for heat treatment	1.90	Rarely
30	Pipe cutter	1.76	Rarely
31	Punches	4.52	Often
32	Life vehicle	1.50	Rarely
33	Dead vehicle	1.70	Rarely
34	Diesel vehicle	1.64	Rarely
35	petrol engine	1.55	Rarely

Table 8. contd

36	Chasis	1.76	Rarely
37	Spanners open ended	4.17	Often
38	Ring spanners	4.38	Often
39	Socket spanners (boxes)	4.35	Often
40	Ball pein	4.20	Often
41	Pullers assorted	1.60	Rarely
42	Grease guns	1.60	Rarely
43	Screw driver assorted	4.47	Often
44	Pliers assorted	4.35	Often
45	Chisel assorted	4.38	Often
46	Files assorted	3.94	Often
47	Engineers square	2.35	Rarely
48	Allen keys	2.08	Rarely
49	Twist drills	4.20	Often
50	Tread cutting taps and dies	1.82	Rarely
51	Rubber mallets	2.08	Rarely
52	Tyre levers	1.64	Rarely
53	Air compressor	1.76	Rarely
54	Battery charger	4.26	Often
55	Welding equipment (gas)	4.47	Often
56	Electric soldering irons	4.5	Often
57	Soldering lead	4.00	Often
58	Grinding machine	4.29	Often
59	Wheel balancing machine	1.87	Rarely
60	Wheel alignment machine	1.88	Rarely
	Grand mean	3.01	Rarely

X- Mean response of items, Often- Often Utilized; Rarely- Rarely Utilized.

Table 9. Summary of the utilization of physical facilities for the attainment of educational objectives of technical education in the course areas.

S/No	Course area	Often utilized		Rarely utilized		Total
1	Applied electricity/electronics	24	59%	17	41%	41
2	Building construction/woodwork	27	45%	33	55%	60
3	Metalwork/automechanics	26	43%	34	57%	60
Total		77	49%	84	51%	161

Table 10. Summary of the analysis of variance of the three areas on the instructional approaches suited for the attainment of the cognitive domain educational objectives.

Source of variance	Sum of squares (ss)	Degree of freedom (df)	Variance estimate	F-ratio (f)	F-critical	Level of sign.
Between groups	0.27	2	0.14	0.70	3.19	0.05
Within groups	9.72	48	0.20			
Total	9.99	50				

study, the following conclusions were drawn:

Physical facilities are inadequately provided for instructional purposes in the universities under study. This is because of the 161 physical facility items listed, only 22 were provided in adequate quantity in the 3 universities under study. Worst still is that all the universities under

study fall within a range of 66% in the number of physical facilities items that are adequate, an inadequacy level of between 44 to 50%.

The course area of metalwork/ auto mechanics has just an adequacy level of 19 physical facilities in all the Universities, Building construction/woodwork has only 22 items adequate in the 3 universities, while the course area of Applied Electronics has no item in adequate quantity in a the universities under study. On the utilization of the physical facilities for the attainment of the educational objectives of technical education, only 77 physical facility items out of the 161 items listed were often utilized for the attainment of the educational objectives of technical education programmes. This number represents 48% of the 161 physical facility, other items are either not available for use, or are abandoned and neglected by the lecturers for utilization and the attainment of stated educational objectives.

Recommendations

The recommendations of this study are as follows;

i.) Institutions should be properly funded for physical facilities to be provided to meet with the NUC recommendations by the Universities that have their facilities in a short fall.
ii.) The National universities commission (NUC) should insist on the provision of the minimum standard requirement of facilities before any Nigerian universities could be accredited to offer any technical education programme.
iii.) Though it was observed that some physical facility items were inadequate, record however showed that those available or existing in the institutions were being utilized for the attainment of educational objectives. It is therefore a recommendation arising from the results and finding of this study for lecturers to increase their level of utilization of the physical facilities for the attainment of the three domains of educational objectives in the taxonomy, the cognitive, the affective and the psychomotor domain of technical education programmes.
iv.) Lecturers should recognize and adopt instructional purposes, suitable for instructional approaches in technical education that properly internalize knowledge, value and skills, through a breakdown of educational objectives into level of what has to be learned in the cognitive, affective and the psychomotor domain.
v.) Lectures and other educationalists should in attempt to attain the cognitive domain educational objectives of Industrial technical education, with the use of physical facilities, adopt instructional approaches that teach comprehension, application, analysis, synthesis and evaluation, as specified and accepted as suitable for the attainment of educational objectives of technical education programmes.
vi.) Lecturers of technical education should adopt instructional approaches in association with physical facilities that enable the attainment of the effective domain educational objectives. The approaches should lead to the entire continuum of receiving responding, valuing, organizing and characterizing in a value complex.
vii.) It is also the recommendation of this study that instructional approaches to be adopted by lecturers should be suitable for the attainment of the psychomotor domain educational objectives. The approaches with the use of the physical facilities should lead to the attainment of the sublevels of the psychomotor domain, leading the learner to perceive, set for and activates respond to instructions, mechanism in degree of a skill performance, adoption to new problematic situation and expertise through origination.

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